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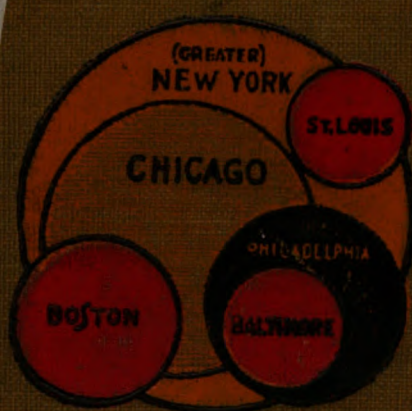
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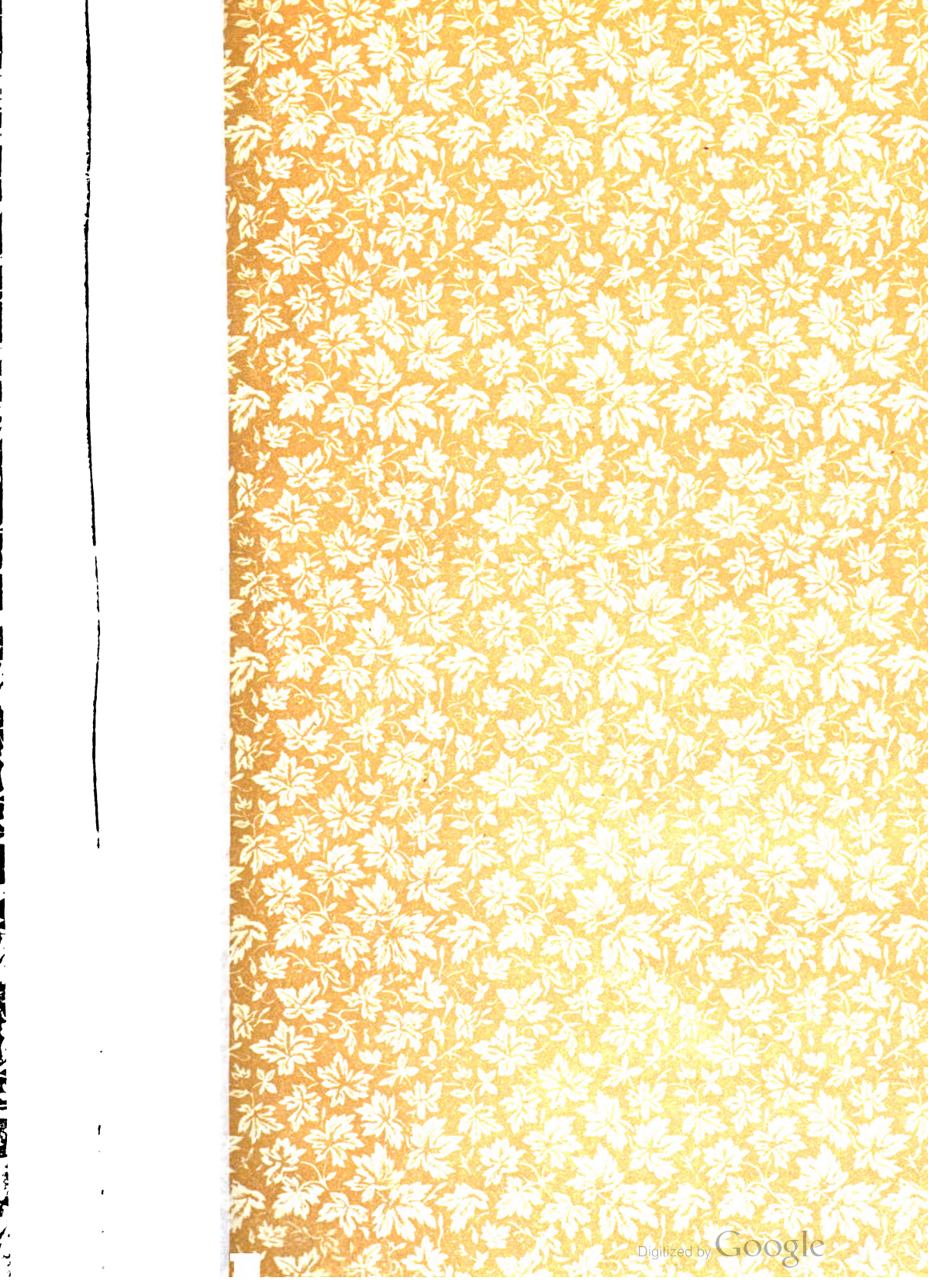


LOCATION,
ORGANIZATION & MANAGEMENT OF
AMERICAN INDUSTRY

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SUCCESS ...IN... BUSINESS

VOLUME III

BUSINESS GEOGRAPHY
AND THE
DEVELOPMENT OF AMERICAN INDUSTRIES

BY

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THE LOCATION, ORGANIZATION AND MANAGEMENT OF AMERICAN INDUSTRY

INTRODUCTION

↓ It is the author's purpose in this book to familiarize the reader with the principal facts of our industrial and commercial life. We are here concerned with three questions:

- (a) Why is industry located where it is located?
- (b) In what way is industry conducted to produce articles of value?
- (c) How are those articles of value distributed to the people who have money to pay for them?

In a field of study of such vast extent we can do no more than consider a few leading facts in each division of the subject. We shall first discuss the general geographical differences between the American continents and the continents of the eastern hemisphere. Next in order we shall discuss the peculiar advantages which are conferred by the situation and geographical structure of the United States upon its people in their pursuit of wealth. Having clearly indicated the points of general difference and advantage which distinguish the United States, we shall go on to discuss in more detail the economic geography of the United States; that is to say, the arrangement of land, water, soil, climate, plants, animals and minerals in this country, which make up what is known as our physical environment and which determine very closely the industries of different sections of our

country. To illustrate: The industries of Pennsylvania are entirely different from those of Minnesota. Pennsylvania is primarily a coal mining state, and therefore, great manufacturing industries, especially iron and steel, have been built up within her borders. Minnesota, on the other hand, has no coal but is peculiarly adapted to the growing of wheat. The flour milling industry has, therefore, centered in Minnesota. North Carolina has a warm, even and moist climate. Cotton culture springs up naturally under these conditions. This state has also a number of waterfalls which furnish abundant water power for factories. North Carolina is, on this account, destined to be a great cotton manufacturing center. Massachusetts and Connecticut are far removed from the cotton fields by their geographical position. They have no coal, and their water power is already utilized.

From these geographical facts we can predict that North Carolina will outstrip Massachusetts in cotton manufacturing. In the same way we can explain the growth and prosperity of Chicago, Buffalo and New York City. In order to avoid the high mountains of Pennsylvania, the greater part of the freight which has been sent to the seaboard from the West has first been collected at Chicago and the other lake cities and then sent by the northern route, skirting the southern shore of Lake Erie and passing across New York State and down the Hudson river. On this account, because of the steep grades of the Allegheny Mountains, Philadelphia and Baltimore have always been, as it were, shut off from the states west of the mountains and have, therefore, suffered in competition with New York.

Enough has now been said on this point to show the supreme importance of geographical conditions in determining the nature and location of industries, and to convince us that a preliminary study of this so-called Economic Geography is necessary to a proper understanding of our subject. We shall, therefore, first consider the geographical situation of the United States; its climate as determined by that situation; the main physical features of our country; its vegetable and animal resources as conditioned by the facts just mentioned, and finally its mineral resources. Next in order, we shall study the location of the most important industries of the United States, explaining

their location on the basis of geographical conditions of soil, climate and resources. Having explained the location of industry, we shall then go on to consider the organization of industry for the purpose of production, and the methods which have been developed for the production of the product and for carrying it to market. In the discussion of this phase of our subject, we shall consider the coal and iron industries; the grain and meat industries; the cotton industry, and the lumber industry.

Having gained some acquaintance with what may be called the physical facts of industry, we shall discuss the business relations and arrangements which have grown up on the basis of those physical facts. We wish to know how industry is organized; how, in other words, a mill or a mine is run. Under this branch of the subject we shall endeavor to show something of the principles which underlie successful business management. Having organized our mill and started it to running, we have next to dispose of the product; and this introduces us to a study of the methods of shipping and selling goods. Under the methods of shipping, we have to consider the relations of the shipper to the railways and the principles which determine the amount the shipper must pay for the transportation of his freight. Under the second will be studied the organization of the wholesale markets, the nature of produce speculation and its relation to industry and trade, and the relations between producer and consumer, including

- (1) Direct relations between producer and consumer, as when railroads and large establishments are the buyers, and
- (2) The indirect relations, where the goods must be sold to the individual consumer.

Under the second head will be discussed the relations between manufacturer, jobber, wholesaler, and retailer—the functions of the commercial traveler, the credit man, and the commercial agency, the methods of advertising and collecting. It is not expected to give within the limited space of this book an exhaustive treatment of any one of the subjects to be studied; the student when he enters business will find that his life-time is too short to completely master even a small portion of the field.

Nor is it desirable to burden his mind with a quantity of technical detail concerning railway billing, express, mail and telegraph service, conveyance of property, and the like. All such knowledge can be acquired when it is needed. It is believed, however, that a general understanding of the location of industry, the organization of production, and the methods of distribution of products and the sale of goods can be gained by a careful study of the field to be covered in this book.

PART I.

SECTION I

THE GEOGRAPHICAL DIFFERENCES BETWEEN THE AMERICAN CONTINENTS AND THE CON- TINENTS OF THE EASTERN HEMISPHERE.

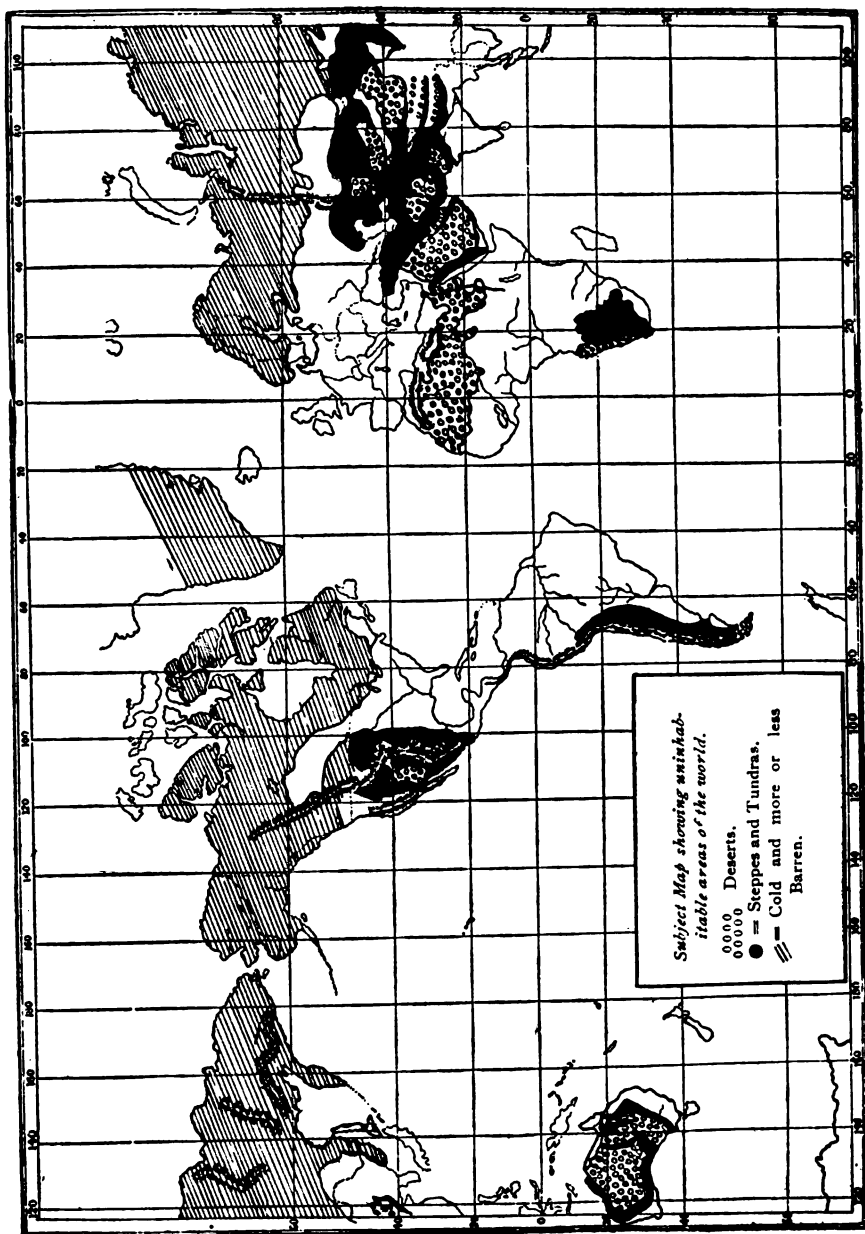
(1) Physical Conditions of the Old and New Worlds

Take a map of the world and notice the arrangement of mountain ranges on the five continents. In the old world, the eastern hemisphere, you will observe that the mountains run east and west, while in the new world their general direction is north and south. We are hearing a great deal nowadays about the decadence of the old world and the rapid progress of the nations of the West, particularly of the United States. Did it ever occur to you that the arrangement of mountain ranges in the continents of the two hemispheres had anything to do with the decadence of the one and the growth of the other?

Another glance at the map will show that the eastern hemisphere is the realm of deserts and high barren plateaus. The northern part of Africa is a desert, the northern half of Russia is little better, Asia is more than two-thirds desert, and four-fifths of Australia is permanently arid and sterile. In the new world, on the other hand, with the exception of small areas in North and South America, no deserts in the true sense of the term can be said to exist. Practically the whole of the western hemisphere is available for agriculture and the production of food for a large population. It is this fact which ensures permanent economic and industrial supremacy to the new world; and, as we shall see presently, the United States is of all the nations of the new world the one best fitted to be the home of a great people and the seat of a great civilization.

(2) Why is the Desert Area of the Old World so Much Greater than that of the New ?

The deserts of the old world and the absence of deserts in the new world can be explained by the peculiar difference in the



arrangement of mountain chains. Vegetation requires heat and moisture. Moisture is to a large extent supplied to the lands which lie north and south of the equator. The air above the bodies of water in the torrid zone becomes saturated with this moisture which is drawn up by the heat of the sun. This saturated air rises and flows off toward the poles, and cooler air rushes in from north and south to take its place. If the moisture-laden warm winds from the equator meet with no obstacle, they gradually cool in their progress toward the poles, and this cooling process condenses, or squeezes out the moisture which they contain, resulting in large rainfall evenly distributed from east to west and gradually diminishing from north to south.

If these winds, however, in their north or south course meet with any obstacle, such as a mountain range, they are deflected upward into the cooler regions of the atmosphere, where their moisture is suddenly condensed and falls as rain or snow on the hither side of the mountain, while the further side gets hardly any moisture from the dried out winds which sweep over the summits. The arrangement of mountains in the old world which I have mentioned is such as to shut out the greater portions of the eastern continents from more than a small amount of moisture brought from the torrid zone. Africa is a table-land surrounded by mountains, which catch most of the rainfall on their seaward sides; Europe is cut in two by mountains which make most of the northern part cold and sterile; Asia is even more unfortunate than Europe. Arabia and Persia are plateaus and therefore deserts; most of the Chinese Empire and all of Siberia are cut off from the moist winds coming from the south by the highest mountains in the world. Only India, farther India, China proper, and the Asiatic Archipelago are well watered. Australia is a table-land surrounded by mountains, and is almost all desert.

We can now understand the tremendous disadvantage of the old world in competition with the new. Its physical structure makes the greater part of its area a desert, incapable of sustaining a large population or a high civilization.

(3) Future of the New World

When we turn to the new world we can also understand

the reason for its great advantages over the old world. The mountain ranges of the western continents run north and south and give free play to the moist winds from the equator. Moreover, the fact that the highest mountains are on the western borders of North and South America is an additional advantage, for the general tendency of the equatorial winds is toward the northwest and the southwest. Only a narrow strip of land on the west coast of the two continents suffers from a scanty rainfall. Most of the American continents lie to the east of the high mountains and offer no obstacle to the free passage of the moist winds.

Nearly the whole area of the new world, therefore, is habitable and cultivable. With the exception of northern Canada and a small portion of South America, practically its entire area can be utilized for the support of a dense population. Owing to this fact, the future is with the new world. The American continent is to be the seat of the great civilizations of the future. On the western side of the Atlantic will be found the great centers of population, wealth, and industry, which the next century will behold. The new world is the land of promise because it is the land of rainfall, and this advantage it owes absolutely to the fact that its mountain ranges run north and south while the mountain ranges of the eastern continents run east and west.

SECTION 2.

THE NORTHERN NATIONS COMPARED WITH THOSE OF THE TORRID ZONE.

(4) Purpose of this Section

We are now to consider the economic geography of the northern part of the American continent and particularly of that part embraced within the limits of the United States. Having observed the general advantages of the new world over the old world, we are ready to study the causes which have given and which will continue to give the industrial and commercial supremacy of the new world to the United States; to discover why (to use the words of an American geographer), the United States is fitted to be the home of a great people.

(5) Physical Divisions and Characteristics of the Five Continents.

Turn back now to the map of the world, and carefully observe the shape of the five continents and their general arrangement. You will see at once that the equator divides these continents into two groups, a northern group of two continents (counting Europe and Asia as one), and a southern group of the same number. These two groups of continents may also be distinguished by their form in relation to the equator. The southern groups narrow toward the poles, and the greater part of their area lies within the hot, or torrid zone. The continents of the northern group, on the other hand, narrow toward the equator and broaden as they approach the cold regions about the North Pole.

The result of this peculiar arrangement of land forms is that in the northern continents the greater portion of habitable areas, comprising nearly all those regions which can support a large population, have a colder climate than the main bodies of the southern continents, which lie, as I have just stated, within the hot belt surrounding the equator. The colder climates of the

northern continents have always had a most important influence upon the character of their people, and it is in large measure owing to that cold climate that the ruling races and the great conquering nations have always had their seats in the north.

(6) Habits of Man in the Warmer Climates

Man is by nature little more disposed than the lower animals to hard work and strenuous endeavor. He has no desire to eat his bread by the sweat of his brow if he can sustain himself without working. In the warm regions of the world, hard work is unnecessary to sustain man in a comfortable existence. Fruit and nuts in great profusion and almost endless variety fall or hang from the trees. The streams swarm with fish, which can easily be caught at all seasons of the year. Game also is abundant. Cold is unknown, clothing and shelter almost superfluous. Under such conditions, man needs not to work and he is content to sleep and idle his life away. Generation after generation, century upon century, find him still in the same condition of drowsy indifference. Progress and improvement are not thought of, because the inducement is lacking. Man is entirely comfortable and secure in his comfort.

(7) Habits of Man in the Cold Climates

In the colder regions the conditions are different. Here the climate is harsh and inclement. The winters are severe, locking up land and water in snow and ice. The spontaneous productions of the forest are less abundant, and must be won with more labor. In the north man must work, and work hard in order to live. Unless he works and plans, unless he denies himself present satisfaction in order to provide for future wants, he will perish. Compelled to exertion, he begins to subdue the difficulties which encompass him. He builds houses for shelter. He provides clothing. In order that food may always be at hand, he develops agriculture and domesticates animals. By slow degrees he organizes civil society, so that by the united strength and co-operative effort of many hands his hard task may become easy. In short, he begins to get the better of the physical con-

ditions of soil, climate, vegetation and animal life which surround him. He becomes, as we say, master of his environment.

(8) The Consequences of Man's Disposition to Labor in Northern Climates

This discipline of hard work has had important consequences. Strenuous exertion becomes habitual. Men keep on working and improving because productive activity has become second nature to them. Their food, their tools and their weapons, their houses and clothing improve. Their societies expand, until, by dividing their manifold labors, they are able to accomplish an amount of work which would have been impossible to a single family.

The habit of work, which was forced upon man during the long ages while he was getting the mastery of a cold climate and an unfriendly soil, has continued to drive him onward; and the new wants and desires, which the power of satisfying them has developed, have so co-operated with the habit of work that man has succeeded in uprearing in the northern latitudes a group of splendid civilizations. Meantime, the lands of the south sleep away an unchanging existence in the torpid contentment of easy satisfaction, and are only aroused from their pleasant lethargy by the strong hand of the northern invader.

Not only is man compelled to work in the northern latitudes, but the rapid changes of temperature unite with the prevailing cold to stimulate and quicken his activities. Great and sustained energy is impossible in a hot and moist climate, but the rapid alternations of warmth and cold, the constant shifts of weather, and above all the long winters of the northern countries act as a constant stimulus, a series of electric shocks, to keep men on the stretch, and to get from them their utmost degree of effort and accomplishment.

It is, then, primarily to their colder climates that the northern nations owe the supremacy which they enjoy. Of all these northern nations, the United States is best suited, as well by climate as by other physical advantages, to be the home of a permanent industrial supremacy.

SECTION 3. THE UNITED STATES

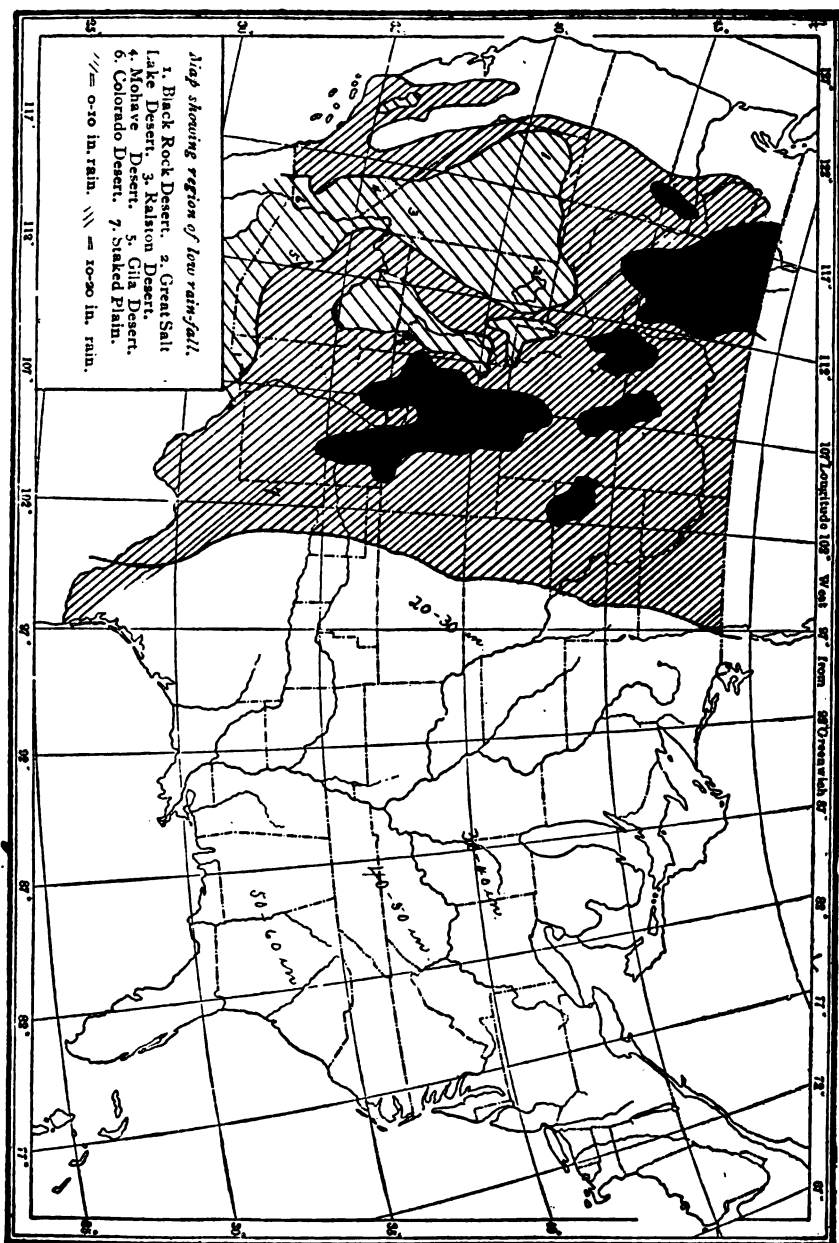
(9) Location

Carefully observe the map which will be found on the opposite page. Let us briefly consider, with constant reference to this map, certain important advantages possessed by the United States. To begin with, the greater part of the North American continent, and practically the entire extent of the United States, lies within the habitable area of the globe. The northern part of the continent is permanently sterile on account of the cold. But this area lies north of the northern boundary of the United States. Not only this, but the habitable area of the western part of the continent extends so far to the north as to include not only all of the states, but also a considerable portion of Alaska.

Thus, while well-nigh the entire area of the United States enjoys the advantage of a cool climate, but a small portion of this area is condemned by excessive cold to perpetual barrenness and solitude. Compare this situation with that of Russia, where more than half the empire is sterile from the cold, and we can the more clearly realize the advantage conferred upon our people by the situation of the country—far enough north to enjoy the benefits of a temperate and cool climate, and yet not so far north as to prevent the growth of crops and the existence of a large population.

(10) Moisture and Rainfall

Not only is the industry of the United States unfettered by cold, but it is almost equally fortunate in regard to moisture. In Section 2 I have shown how the situation of the mountain ranges on the American continents insures an abundant supply of moisture over their entire area. This statement should be slightly qualified when it is applied to the region of North America lying between the 100th meridian of west longitude and the coast range, the region which is represented by light shading



upon the map. This region has a relatively small rainfall, nowhere exceeding 20 inches per annum, as compared with 30 to 60 inches in other parts of the country. Moreover, this rainfall is unevenly distributed, falling, for the most part, during the winter months in the form of snow, and mainly upon the mountains, from which the numerous and important streams that traverse this region are constantly supplied. This situation precludes the success of ordinary methods of agriculture within this region. Numerous failures have been the results of attempts to grow crops of corn, wheat, and oats within this area, which has, until recent years, gone by the name of the Great American Desert.

It has, however, developed that the rainfall of this region was abundantly ample for grazing purposes, and the Great Plains have become the source of meat supply for the Eastern states, much of the land now supporting a profitable cattle industry; for example, in Western Kansas, which was proved utterly unfit for corn and wheat culture. It has also been discovered within the last forty years—the discovery was first made by the Mormons—that large portions of this so-called arid region can be made highly productive by conducting over the land, the water of the large and numerous streams that are fed by the melting snows of the mountains. It can, therefore, be asserted that even the desert region of the United States can be made to sustain a large population.

Compare our American desert with the Desert of Sahara, with Central Asia, or with Australia—regions where, save on small and scattered oases, neither agriculture nor herding can exist, where millions of square miles are forever lost to civilization—and we can the better appreciate the important benefits which the situation and the physical structure of the North American continent confer upon its inhabitants. On the west coast, California presents the same conditions as the Great Plains and the Rocky Mountain region, with this modification: That, owing to the close proximity of the Sierra Nevada Mountains to the coast, the amount of water available for irrigation is ample. Oregon and Washington west of the Coast Range have a greater rainfall than any other part of the United States. This is due to the warm winds which blow up from the southwest, and

whose moisture is condensed on the high mountains of the Cascade Range.

(11) Climate and Productivity

East of the 100th meridian and including the area represented by the dark shading to the Atlantic Ocean, practically the entire area of the United States is abundantly watered and therefore tillable. The rainfall of this region is more copious than that of Europe, and is well distributed throughout the year. Droughts, where they occur, are of local significance. Famines are unknown. Not only are the crops of this region reasonably certain, but, owing to its wide extent, and especially owing to the north and south extension of the United States, these crops include practically all the vegetable products of the temperate and sub-tropical zones. Without extending so far south as to weaken and enervate our people by the damp heat of the tropics, the southern part of the United States, particularly the peninsula of Florida, has a climate which admits of profitable culture of sugar cane, rice, and tropical fruits. Ascending through the Mississippi valley, we pass in succession through the cotton belt, the tobacco belt, the corn belt, and the wheat belt; while in the extreme north the hardier kinds of small grain, such as rye and barley, can be successfully grown. This wide variety of climate and products makes the United States almost completely self-sufficient and, therefore, economically independent of foreign nations. Her soil can produce the food and clothing of her people.

This same conjunction of moist and variable climate explains the presence of the immense forests which originally covered practically the entire area east of the Mississippi, including a great variety of woods, from the pine and spruce of the north to the magnolia and cypress of the Gulf states. This profusion and variety of timber have been at all times a great aid in our national development.

(12) Location of Early Settlements

In the early years of our national history the dense forests afforded abundant material for ship building, and at the same

time forced the colonists to betake themselves to the sea because of the difficulty of penetrating the dense forests west of the seaboard. Confined within a narrow strip of coast line, the English colonists developed strong, self-reliant, populous communities. Relying alike upon commerce and agriculture, they early developed and practiced the principles of civil government and civil liberty, while the French and Spanish colonists, entering the country by the Mississippi on the south and the Great Lakes on the north, scattered over the vast open spaces and along the extensive river systems of the interior and never succeeded in developing any great measure of independent strength.

(13) Struggle for Colonial Empire

Thus, when the struggle for race supremacy came in the colonial wars of the 18th century, it was the English colonies who triumphed, and who, from their early discipline and the concentration and centralization of their power, were able a little later to win their independence from the mother country. After the Revolution, the great forests were penetrated and subdued, and the westward expansion of the United States began. Do not understand me to assert that the triumph of the English over the French was due entirely to the accident of their location to the eastward of the great forests. Other causes, political and religious, with which we are not at this time concerned, contributed largely to their success. The forests, however, did play an important part in guiding the early course of our national development, and throughout our subsequent history they have greatly aided our industrial and commercial progress by furnishing an abundance of timber for buildings, fences, bridges, and fuel.

(14) Other Advantages

Another point of advantage to the rapid development of the United States was the fact that all the plants and animals of Europe could be readily domesticated in the new world. The agricultural skill and experience of Europe, the results of centuries of experiment, were transplanted entire to the new world. The American continent also supplied to the colonists Indian corn,

which was peculiarly valuable to the pioneer because it grew readily in clearings and produced on new ground abundant crops with comparatively little attention; and the potato, which, carried over from the new world, has long since become a staple article of diet among the people of Europe. Almost the entire area of the United States was healthful, in striking contrast to the lands of tropical America, whither the Spaniards directed their efforts. Disease offered no resistance to the rapid settlement of the country.

The final point of advantage which has very powerfully contributed to the growth and present power of the United States is the fact that this is, geographically speaking, one country from the Atlantic Ocean to the Rocky Mountains. Only the western mountain region and the narrow strip of territory on the west coast can be said to be separated from the rest of the country, and it is not in these regions that the dense population and high industrial development are to be found.

East of the Rocky Mountains the whole area of the United States is a geographical unit and is predestined by nature to be the home of a single people, firmly united—and therefore invincible—and at peace,—predestined, not merely because most of its surface is an open plain, but because of the enormous river systems which center about the Mississippi river, the chain of lakes along its northern border, and the many navigable rivers of the Atlantic seaboard. *

(15) Geographical Units

To grasp the industrial importance of this fact, notice on the map the arrangement of the continent of Europe. This continent is split up into a great number of parts by high mountains and by arms of the sea. This separation has given opportunity for the growth of separate nationalities, which could live their own lives in their own way without relation to the lives of their neighbors. National life closely follows the divisions of geography. Spain is separated by mountains from Portugal and from France. Great Britain is completely isolated, and within Great Britain, Ireland has a separate nationality. Scandinavia is separated from the rest of Europe by the sea, and Norway and

Sweden are parted by mountains. France is a geographical unit, Italy another, North Austria and Germany another, Turkey and Greece another, and Russia is clearly marked off from the rest of Europe.

(16) The Effect of National Isolation

This geographical and national isolation has led to innumerable wars between the strangers, and yet no one nation has ever been able to subdue the rest. Geographical barriers and the racial differences which they have produced have time and again proved too strong for military power. The Roman Empire, the Empire of Charlemagne, the Empire of Napoleon, each broke in pieces on the sharp edges of mountain barriers; and Europe has again and again fallen back into the condition of savage war and armed peace. Her people are burdened with debt taxes, war taxes, and conscription. Her credit is almost exhausted. Her business is carried on in constant apprehension of war. Her society is cast in a military mould. Her despotisms rest upon military foundations. The land groans and cries out in misery and anguish of militarism. The shadow of conflict hovers over the whole face of Europe, to chill, to paralyze, and to stunt her industrial development.

(17) Effect of National Unity

How different is the situation in the United States! Here there is but one land and one people. All the evils of militarism which curse our European competitors are absent from the United States. Our men are in the fields and shops, not in the barracks. We have no foes to fear, for we possess a continent. Our taxes are low, our institutions are those of civil liberty, and our people are free to devote themselves to the production of wealth. Only once has our national development been retarded by civil war, and then the geographical unity of the country, especially the presence of navigable streams throughout the southern states, made possible the invasion and complete subjugation of the Confederacy and removed the last obstacle from the path of our industrial progress—a feat that would have been utterly out of the question had geographical barriers intervened.

This unity, perhaps our greatest advantage, is due to those features of the structure of our continent which have already been described and which allow an easy passage over the whole area of the United States east of the Rocky Mountains—a wide open plain, intersected only on one side by low mountain ranges and penetrated throughout by navigable rivers.

SECTION 4.

THE ECONOMIC GEOGRAPHY OF THE UNITED STATES

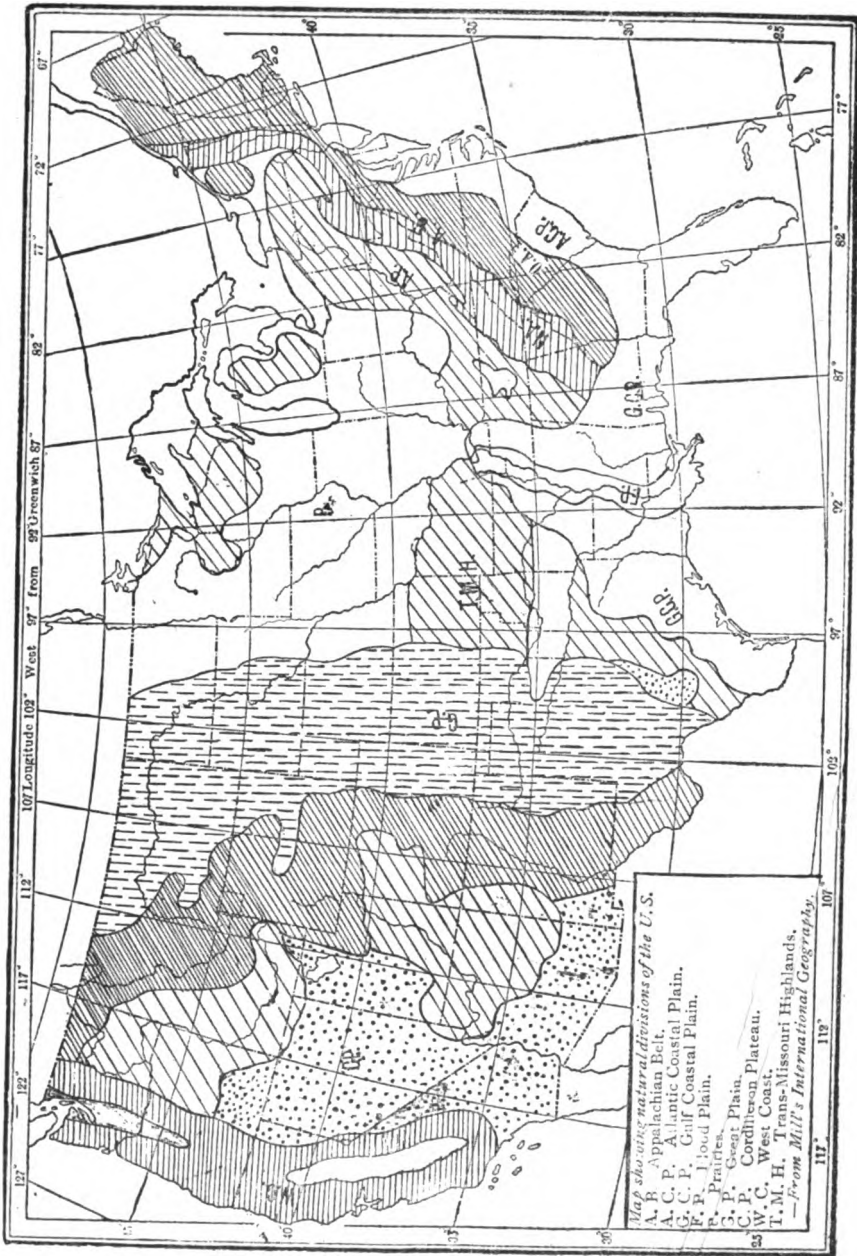
THE APPALACHIAN BELT

Having indicated some of the more general features of our physical environment, we shall now proceed to discuss in greater detail the geographical features of the United States, preparatory to a minute consideration of the various products which our country affords.

(16) *Appalachian Belt*

The map which accompanies this section shows in outline the geographical divisions of the United States. Observe the various divisions. We have first an elevated region (represented by a belt of dark shading) in the eastern part, known as the Appalachian Belt (A B). This extends from northern Maine to northern Alabama. It includes practically the entire area of the New England States and a broad belt of territory extending southwest from Massachusetts, narrowing as it passes through the Middle States and widening to include a much larger area in Virginia, West Virginia, the Carolinas, Georgia and Tennessee. This is the mountainous region of the eastern part of the United States.





(19) Effect of Water Upon Mountains

In early times these mountains were much higher than at present. Millions of years of steady wear from the water which has rushed down their sides to east and west has lowered the original mountains to mere fragments of their former size. Indeed, at one time this whole area is believed to have been a great plateau. So thoroughly have the streams done their work that only scattered elevations are left to mark the sites of the old ranges. It is further believed that much of the mountainous appearance which this area now presents is due to the work of the streams in wearing away and cutting through the softer rocks, leaving the harder formations.

(20) Further Divisions of Appalachian Belt

This Appalachian belt may be further divided into an eastern and a western belt, which are separated on the map by the dotted line, and further indicated by the letters O A and N A. The rocks of the older, or eastern belt are much harder than those of the western portion of this region, on which account the eastern part is the country of high peaks and narrow valleys; while in the western part, because of the wearing away of the uplands by the streams, the valleys are much broader and the elevations less marked.

The cultivable portions of this area are found in the valleys, along the coast of New England, and in the Carolinas, where the formation of the eastern portion of the belt is that of a table-land with comparatively few elevations. Three breaks occur in the Appalachian belt; one through the Mohawk valley, one in Pennsylvania where the mountains are low, and a third in Virginia, down the long valley of the Shenandoah, and through the Cumberland Gap into Kentucky and Tennessee. It was through these openings that the emigrants from the east penetrated to the western country. The easiest passage was up the Hudson through the valley of the Mohawk, from which it was no great distance to Lake Erie and so on to the West. Those who took the middle route passed down the Ohio, and the southern pass gave access to the Cumberland and Tennessee rivers.

The Atlantic shore line of the Appalachian belt is of especial interest. Here many arms of the sea enter deep into the land and afford a great number of excellent harbors. Back from the coast for an average distance of 100 miles, agriculture can be followed because the highlands have been worn down to a level. Timber was everywhere abundant in the early days, and this conjunction of excellent harbor facilities with considerable agricultural resources was made the basis of an extensive commerce in which New England was for a long time pre-eminent.

(21) Water Supply

Another feature of permanent importance in the Appalachian belt is the abundance of water power which it affords. This is especially true of New England and certain sections of the South, mainly in the Carolinas and Georgia. The New England streams as they fall from the highlands develop in the descent a large amount of power, which is concentrated by natural dams composed of rocks and gravel rolled along by the streams and accumulating at intervals, thus backing the water into numerous ponds and lakes, which act as storage reservoirs for surplus accumulations of water during the wet seasons. The water power of New England is the main cause of her manufacturing development. Every considerable fall within easy reach of the centers of population has been utilized for manufacturing purposes.

In the South, the arrangement of power is less favorable, but the greater extent of territory which drains into the streams and the fact that the Appalachian belt is bordered by an alluvial plain upon which the water's can readily take effect, have produced along the edges of the belt a series of falls and shoals, which give a large amount of power.

(22) Utilization of Water Power

The location of this power in the midst of the cotton fields has encouraged its use for cotton manufacturing, and within a few years it will be entirely taken up and employed for industrial purposes. The amount of power still available in this region, moreover, is very much greater than in New England, and the prospects of the South for manufacturing growth are, therefore, brighter than those of the Northeastern states.

There is also abundance of power in the western part of the Appalachian belt where the streams fall toward the Ohio, but here the country is so broken and rough and the difficulties of transportation are so great that the utilization of this power must be carried on very slowly. It may be, however, that it will be found practicable to transmute this water power into electric power, and in this way send it out of these inaccessible regions down to the plain country, in which case the waterfalls of the western Appalachian belt would become valuable.

THE ATLANTIC COASTAL PLAIN

(23) Position and Extent

The second feature of the geography of the United States which is deserving of notice is the Atlantic Coastal Plain. It extends from Long Island Sound to the peninsula of Florida, and from 100 to 300 miles back from the seaboard. Its name is sufficient for a general description of this region—a low, flat plain along the seaboard, gradually rising as it approaches the highlands of the Appalachian belt. It has been formed by the joint action of the streams in wearing down the highlands above it, and by the action of the sea in building up the shore land with large drifts of sand. The greater part of the plain is fertile. For some distance back from the shore, however, the Atlantic Coastal Plain, along its entire length, consists of sand dunes and marshes which are usually impossible to cultivate without drainage, or without extensive works of embankment or tree planting to keep back the sand and give vegetation a chance to start. Numerous works of this kind have been undertaken, especially in the southern part of the plain. This coastal plain contains the densest population of any part of the United States, being the oldest settled portion of the country. It has long enjoyed the advantage of handling the foreign trade of the nation. It has built up great manufacturing industries to supply the wants of the South and West, which have only recently begun to manufacture for themselves, and it has had the first choice of all European immigration. The last census showed that the most rapid increase of population from 1890 to 1900 was in the states of the Atlantic seaboard.

(24) Great Dismal Swamp

The Great Dismal Swamp in northeastern North Carolina and southeastern Virginia is being rapidly reclaimed by extensive drainage operations, and every year large areas of swamp land are converted into fertile farms. As the value of land in the Eastern states continues to rise, there is but little doubt that the greater part of the Atlantic shore belt will be reclaimed for agriculture. The shore line is fringed with sand dunes forming shallow lagoons between them and the shore—indications of the land-building operations of the sea and the rivers. These channels or lagoons grow more and more shallow, and unless constantly dredged become in time impassable. Eventually, if not artificially prevented, the lagoon will be entirely filled up and a new shore line formed.

(25) Rivers of the Coastal Plain

The rivers of the Coastal Plain formerly ran at a much higher elevation than at present. A general subsidence or depression of the coastal plain at one time took place, which had the effect of converting the valleys of these rivers into bays and inlets. This influence has been extended far up the rivers so that they are much broader and deeper than the area of their drainage basins would indicate. The Hudson, Delaware, and James rivers are examples. Delaware Bay and Chesapeake Bay are examples of inlets and estuaries formed by subsidence of the land.

The existence of these inlets has been of great importance in the locating of cities. New York, Philadelphia, Baltimore, Richmond, Savannah, and Charleston are all located at the mouth of drowned valleys,* on account of the early development of an extensive commerce between Europe and the people of the Atlantic slope, which these short deep rivers made easy. This point will be taken up again when we come to discuss the general subject of the location of cities.

*The subsidence of the New England coast line has already been mentioned.

THE ALLEGHENY PLATEAU

(26) Position and Extent

The western part of the Atlantic highlands is called the Allegheny Plateau. It lies directly west of the Appalachian belt, extends from northern New York to northern Alabama, and includes portions of the states of New York, Pennsylvania, Ohio, Virginia, Kentucky, and Tennessee. On the east, it is fringed with high mountains; on the west and south it slopes off gradually to the flat regions of the interior and the Gulf shore. The surface is regular and even. This region is remarkable for its stores of mineral wealth and is also still well covered with timber, although in the northern part much of this has been cut away. The whole area of the plateau is underlain with coal and iron, other minerals being found but not in sufficient abundance to warrant extensive working.

(27) Industries

In the southern part, northern Alabama has developed an extensive iron and steel industry, and many other manufactories have been established here on account of the cheapness of fuel. The soil of the southern part of the Allegheny Plateau is generally unfertile, owing to its sandy character, which allows the water to pass off too rapidly for successful agriculture. The middle portion of the plateau, embracing most of the state of Virginia, has abundant stores of coal and iron. Coal mining is the principal industry of the state, no considerable iron industry having been developed because of the greater cheapness of the iron ores of Lake Superior. The soil of this portion of the Allegheny Plateau has been formed from the sandstones which underlie it and is, therefore, unfertile and unable to support more than a small population. This region is, geologically speaking, very old; that is to say, it has maintained its present form much longer than many other parts of the United States. All the streams and rivers of the region have had ample time to wear deep valleys

until the surface of the plateau is very rough and broken—a land of steep hillsides and narrow crooked valleys, difficult of approach and probably never destined to be the scene of great industrial activity.

The northern part of the plateau, which includes the western part of Pennsylvania and the eastern part of Ohio, has generally the same appearance and resources; but it enjoys a great advantage over West Virginia because of the fact that it separates the fertile plains of the East and the West. The great railways cross or skirt this region, and above all it has been for many years and still is the natural seat of the iron and steel industry of the central west. The soil of this region is also more fertile than that of the middle portion of the plateau.

(28) Population of the Plateau

The population of the Allegheny Plateau is chiefly concentrated in northern Alabama and in southwestern Pennsylvania, centers of iron and steel production. Birmingham in the South and Pittsburg in the North are large and rapidly growing cities.

THE PRAIRIE REGION

(29) Position and Extent

Passing by the isolated groups of old mountains and ancient rocks found in northern New York and about the upper lakes, we take up the study of the most important geographical division of the United States from the standpoint of its agricultural importance. The outlines of this region are clearly indicated on the map. It includes northwestern New York, the western half of Ohio, a small portion of northern Kentucky, all of Indiana, Illinois and Iowa, portions of Wisconsin and Michigan, the western part of the Dakotas and Montana, and northeastern Kansas and northern Missouri. Its area may be seen to include about one-sixth of the total area of the United States.

The surface features of the prairie region are not strongly marked. The entire region is a level plain, in some places rough

and broken with low hills and bluffs, but generally presenting a flat and even surface. The eastern part of the prairie region was originally heavily wooded, and an abundance of timber is still found, although not enough, in most places, for a profitable lumber industry.

(30) River System of the Prairie

The river system of the prairie region is especially complete and comprehensive. It embraces the systems of the Ohio on the east and the Missouri on the west, with their numerous tributaries converging and emptying into the Mississippi, which forms the backbone of the system. These rivers were formed in more recent times than the rivers of the Appalachian belt which empty into the Atlantic ocean, and their tributary streams have not, therefore, cut for themselves such deep channels as have, for example, the rivers of West Virginia, so that the flow of the western streams has not greatly damaged the soil as is the case on the Allegheny Plateau. These rivers are, most of them, navigable for some distance above their mouths and were thus of great assistance in the early development of the country before the advent of railways.

(31) Great Lakes

In addition to the network of great rivers, the prairie region is bordered on the north by the Great Lakes. These lakes have always afforded a water transportation for those sections bordering upon them, and even to-day they carry most of the heavy and bulky traffic which goes from the western states to the East.

The level surface and the abundance of facilities for water transportation made the settlement and complete occupation of the prairie region very rapid. After 1850 the railway development of the prairies was carried on with great energy. Railway building over these level plains was an easy matter, and the prairie region has to-day one-third of the railway mileage of the United States. Transportation facilities are so easily provided for the prairies and their surface offers so few irregularities that it needed only a fertile soil to make this region, favored as it was

with abundant rainfall and a healthful climate, the garden spot of the world.

(32) Soil of the Prairie Region

The advantage of the prairie country in the matter of soil is equally pronounced with its other points of superiority. In order to understand this point more clearly, let us consider for a moment the nature of the soil. Soil is composed of small fragments and particles of rock combined with the remains of animals and plants which have been restored to it and which form what is known as the soil covering or "humus"—the open, porous covering which absorbs the rainfall. The basis of soil is decomposed rock. These rock particles contain the mineral elements, such as magnesia and potash, upon which plants feed. The rootlets of the plants surround the particles of soil, taking up and absorbing the plant food which is dissolved out of the earth particles by the water in the soil. The finer these particles, and the larger the amount of finely decomposed rock forming the basis of any soil, the larger will be the amount of plant food available and the richer will be the soil.

The peculiar excellence of the prairie country, from the standpoint of agriculture, is due to the fact that its surface is covered with a deep layer of finely divided rock, in some places making a soil five or six feet deep. This covering of decomposed rock includes a great variety of mineral elements, so that the materials for plant food are present, not merely in abundance, but in great variety. Thus the prairie region has the essentials to a highly developed agricultural prosperity—a healthful and temperate climate, a level surface, abundant transportation facilities in lakes, rivers, and railways, and a deep and fertile soil. All of these advantages, save the first two, it owes to a great event, which, though it occurred unnumbered ages ago, continues to influence profoundly the life of the American people.

(33) Ice Age in North America

The northern part of the North American continent, as well as the northern part of Europe and Asia, was at one time cov-

ered with a sheet of ice whose average thickness has been estimated at one mile. This ice sheet was originally formed in the north and moved down through that part of North America now occupied by the United States, covering at one time and another the area north of the Ohio and Missouri Rivers. These rivers roughly determine the southern limit of what is known as the glaciated area, which also includes practically all of what we now know as the prairies and the whole of New England, New York and Pennsylvania. This enormous body of ice as it moved down from the north picked up or pushed along everything that was movable in the territory over which it passed. Great rocks were broken from cliffs, or the cliffs themselves were cut down and broken to pieces by the moving ice masses. The ice sheet in its slow progress toward the south crushed and ground the enormous quantities of rock which it carried, reducing this rock material to a very much more granulated condition than that in which it was first received. The harder the rock formations over which this ice sheet passed, the greater would be the resistance offered by the fragments broken off, to the grinding and crushing of the ice. After a time the ice receded, that is to say, the great glacier began to melt at its southern side and slowly retreated northward toward the pole. As the ice melted, all the rock material which had been brought down from the north was deposited in the place where it then happened to be.

The eastern part of the glacier, whether because its thickness and weight had been less than that of the western part, or because the rocks which it carried were harder and more resistant, deposited over New England, New York, Pennsylvania and the northern part of Maryland, an enormous number of boulders of all sizes, besides a thick layer of more finely divided rock. Most of these boulders show in the lines and grooves of their surfaces and in their rounded forms the effects of the grinding action of the ice.

In the middle West, however, the glacier crushed the rocks to a finely divided condition and when it receded spread over the whole surface of the prairies the deep rich layer of soil material from which generations to come will continue to grow abundant harvests. The famous soil of the prairies, therefore, as well as

the boulder covered fields of the East, are the result of the great ice age in America, when a mile's thickness of ice ground and crushed its way southward. These glacial soils differ from most other soils in this, that they were often brought great distances to their present location and that, instead of being of uniform consistency, they include a great variety of rock material—limestone, sandstone, granite, shales, etc., all mixed and blended together by the ice in its long journey from the north.

(34) Glacial Soils

These glacial soils, as will be readily understood, are richer because of this variety of composition. The plant elements are not merely abundant but they are all represented in the glacial soils. The United States owes more to the glaciers than its prairie soil. The level surface of the prairies, which especially contributed to the end of rapid settlement by making possible the quick construction of railways, is also due to the glaciers which planed off and leveled down the territory over which they passed. It will be remembered that a few pages back, in speaking of West Virginia, I made the statement that its surface was too much cut up by the action of running water to admit of successful agriculture. Consider the advantage to the state of West Virginia if that state could be planed down to a level surface and the benefits conferred by the glaciers upon the western country could be realized. There is reason to believe that this was the condition of all the country which is now included in the prairies. The streams had been running so long that they had cut deep channels in every direction. The glaciers remedied this and left the country generally level. In the Eastern states, the steep grades of the mountainous plateau have brought about a new elevation of the surface after the glaciers had planed it off and the mountains of the older Appalachian belt were too hard to be worn entirely down

(35) Formation of the Great Lakes

A final effect of the glaciers, which has had a most important bearing on our national development and some of whose

results have already been noted, was the formation of the five great lakes and of the innumerable smaller lakes and ponds which are found in such great numbers in the northern part of this country. The lakes, it is now almost certainly known, were dug out by the ice in its movement over that region; and of the smaller lakes, some were formed in the same manner, while others were made by the piling up of rocks and rock material by the receding ice. As has been shown, the water powers of New England are much greater because of the ponds and natural dams which are everywhere found, and the influence of the great lakes upon our prosperity, in furnishing an important transportation route between the West and the East, has also been stated. The prairies have justly been called the granary of the world. More bushels of the cereals are grown in this region than in the same area anywhere else on the globe. But the almost inexhaustible fertility of the prairies, their plane surface, and their means of transportation they owe very largely to the action of the glaciers formerly covering them.

THE SOUTHERN COASTAL PLAIN

(36) Gulf Plain

Let us return to that part of the Coastal Plain that borders on the Gulf of Mexico and that includes the peninsula of Florida. Reference should here be made to the map on page 24, which shows in outline the limits of the Coastal Plain. It will be observed that it almost surrounds the southern part of the Appalachian and Allegheny region, that it extends northward until it meets the glaciated region in southern Illinois, and that it is cut in two by a narrow strip of land, which is designated on the map as the Flood Plain and which will be examined later.

Considering the Coastal Plain apart from the peninsula of Florida, we find in it few points of interest. It is low along the coast, as is the Atlantic coastal plain, and gradually slopes to the north and west where it passes into the highlands of the Appalachian region. Its soil is generally fertile, having been formed chiefly by the decomposition of the underlying rocks. Along

the coast, however, occurs the same arrangement of sand dunes and swamps that are found along the Atlantic seaboard. These swamp lands are of vast extent, including thousands of square miles. They also occur on the borders of streams emptying into the Gulf of Mexico.

(37) Climate of the Gulf Plain

The climate of this region is naturally much warmer than that of the prairies and the rainfall is much greater, often reaching 60 inches per annum as against 35 inches on the prairies. This combination of heat and moisture, taken in connection with the large swamp area, makes the climate of the lands bordering on the Gulf and the streams which empty into it generally unhealthy. Drainage operations, however, have the effect of not merely reclaiming the soil, but of improving the climate.

One great disadvantage of the Gulf region is the absence of good harbors. The waves of the Gulf are continually piling sand into the channels between the sand dunes and the shore, which makes it difficult to keep navigation open. The same difficulty is met with on the northern coast, but there the numerous drowned valleys afford ample harborage. On the Gulf coast, these submerged valleys do not exist and the commerce of this region is carried on under great difficulties. The recent disaster which befell the city of Galveston was due to the fact that along the whole Texas coast the most available location for a city was on a low sand dune, exposed to the full fury of the storms that sweep up from the Gulf of Mexico. In view of this fact of insufficient harborage, the future development of the trade with South American countries—if it is to be carried on through the Gulf—must pass out and in at the mouth of the Mississippi.

The Coastal Plain is well forested with pine, cypress, palmetto, and the southern varieties of oak, while in the northern part the broad-leaved trees of the northern states are also met with,

THE PENINSULA OF FLORIDA

(38) Florida Peninsula

Properly speaking, the peninsula of Florida is not a part of the Southern Coastal Plain, although it is here identified with it. It is unique in its structure, having been formed at some remote time by an uplift of a portion of the floor of the sea, while its southern extension is being constantly increased by the work of the coral insects. Only the backbone or ridge of this uplift of the sea floor is visible above the surface. Less than one-tenth of the total area of the uplift has been thus uncovered. The surface of the land is underlain by limestone formation.

Although Florida represents the crest of a ridge, the ridge has a depression along the greater part of its length; that is to say, the peninsula is a trough or channel for two-thirds of its length, the shore lines standing much higher than the interior. This does not, however, apply to the northern part of the peninsula, which consists of vast plains of sand formed before the southern portion was raised above the level of the sea. The greater part of the peninsula, owing to this peculiar formation, is a swamp of about 28,000 square miles in extent. The southern portion is at times almost a lake. This fact is due in part to the configuration of the land, which slopes away from the sea toward the center of the peninsula, not permitting natural drainage, and in part to the abundant rainfall due to exposure to moist equatorial winds.

(39) Agricultural Advantages

Furthermore, the rivers which might be supposed to cut their way through to the sea and so establish channels of drainage, sink into the ground and escape through underground channels, leaving only a small portion of the peninsula available for agriculture.

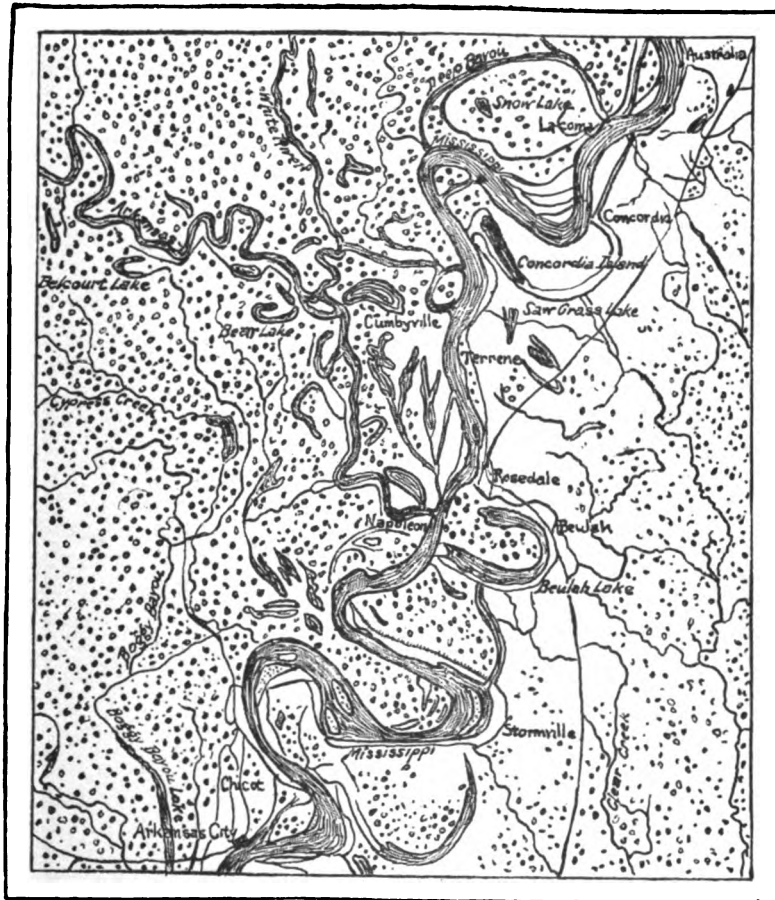
Aside from the conditions just stated, Florida is in every way suited to successful husbandry. The rainfall is abundant

and the climate is sub-tropical, owing to its southerly position. If its soil were to be reclaimed, the peninsula (which contains 18,000,000 acres of swamp land alone, to say nothing of the large sandy plains in the north) would become the source of supply for the United States of most of the tropical products now imported. All the sugar, the fibres, and the tropical fruits which are now brought into the United States from foreign countries could readily be produced in Florida if the peninsula were to receive proper drainage. This work of reclamation is not such a difficult task as might be imagined. It presents a simple problem in drainage, with the additional feature that the channels must be made deeper as they approach the shore. Already a considerable amount of work has been done in this direction, and numerous drainage and land companies are every year formed to develop portions of swamp lands in Florida and other parts of the Coastal Plain. In north Florida, the development of a fertile soil out of the sand plains has been greatly furthered by the presence along the east coast of large deposits of phosphate of lime, which makes an excellent fertilizer. Indeed, the southern part of the Atlantic Coastal Plain is chiefly interesting because of the possibilities of the future development of its swamp lands, and nowhere in the United States are there more promising opportunities for wisely directed effort to reap a rich return.

THE FLOOD PLAIN OF THE MISSISSIPPI

(40) *Extent and Formation*

The accompanying map shows what is known as the Mississippi Flood Plain, or that part of the Mississippi valley bordering the great river from Cairo, Illinois, to New Orleans. It is believed that the lower Mississippi was formerly a bay which extended far up the valley and into which various rivers emptied. The floor of this bay was uplifted by some geological convulsion, just as the floor of the sea was raised to form the peninsula of Florida, and the rivers that were formerly independent were in this way "grafted on a single trunk" to form the



THE MISSISSIPPI FLOOD PLAIN.

—From *Sbaler's United States of America.*

lower Mississippi. The upper Mississippi, which rises in Lake Itasca, was not originally joined with the lower Mississippi and had, in fact, no closer connection with it than the Missouri, the Ohio, or the Arkansas rivers. The Mississippi River of that day emptied straight from the north into the long bay that formerly occupied the site of the lower Mississippi, and for this reason it has been joined in our nomenclature to the lower river. The Mississippi might as well be said to rise in Montana or Pennsylvania with the Missouri or the Ohio, as in Minnesota with the upper Mississippi.

The lower Mississippi, then, which runs through the Flood Plain, is nothing but the channel into which empty the great rivers of the Mississippi valley. Its drainage basin, embracing 1,500,000 square miles, is, next to that of the Amazon River, the largest in the world. The great rivers which empty into it every year carry down millions of tons of rock and earth, much of which is swept along by the main current to the Gulf. The silt which the stream carries with it, constantly changes the form of the river floor, and the immense stream, deflected from its course by fresh accumulations of sand and silt in its bed, swings from one side of the flood plain to another, holding an irregular and crooked course, and often cutting for itself a new channel across some projection of the shore which it has partially separated from the mainland. To further illustrate this point, I have inserted a map of the confluence of the Mississippi and the Arkansas rivers.

(41) Agricultural Disadvantages

You will observe that there are shown on this map five places where the river can make cut-offs and so change its channel. From this cause, as well as on account of the great floods that sweep down the lower Mississippi at frequent intervals, the area of the flood plain, across which the river swings and turns, is low and swampy, cut up and intersected by innumerable ponds and channels, or bayous as they are called. Agriculture is carried on with great difficulty under these circumstances. The soil of this region is extremely fertile, because it is constantly being revived by new accumulations of silt which the floods carry over

it; but the uncertainty of these same floods makes farming on the flood plain precarious business.

Numerous attempts have been made to deepen the channel and so confine the river to regular and certain bounds. The channel has been dredged in many places in the hope that the river would "scour" a deep bed, and the banks have been strengthened and raised by a system of levees or earth embankments similar to those which keep out the sea from the Netherlands. These devices answer well enough in ordinary seasons when the river is low, and then large crops are raised from the fertile fields of the plain. But let a spring of heavy rains follow a winter of deep snows, and the river systems of the whole Mississippi valley discharge their widely accumulated floods into the lower Mississippi in the form of a moving lake from thirty to fifty miles wide. Such floods sweep away all barriers and move down the full width of the channel destroying crops and plantations and inflicting damage which years of prosperity hardly suffice to restore. For this reason the flood plain will probably never reach its full development. Much of it must be left to the mercy of the river.

The irregular course and shifting bed of the lower Mississippi also limit its usefulness as a means of transportation. The risk and trouble of navigation are so great that the railroads have taken from the river the bulk of this traffic, and there is little reason to believe that the Mississippi will ever become an important highway of commerce. It is only within recent years that it has been deemed possible, by a system of jetties placed at one of the four outlets of the river, to compel the stream to scour out a deep channel and thus insure the position of New Orleans as a seaport. This work of keeping the channel open must constantly be attended to, for the river is all the time building out into the Gulf of Mexico.

TRANS-MISSISSIPPI HIGHLANDS

(42) Ozark Plateau

The Missouri river roughly marks the southern boundary

of the glaciated area. There is, however, a considerable area south of the river which is covered with a thick sheet of finely powdered rock material. This layer of drift is in some places thirty feet thick, and affords a soil of inexhaustible fertility. The land south of the Missouri rises gradually into the Ozark Plateau, which includes southern Missouri, eastern Kansas, northern Arkansas, Indian Territory, and a small part of eastern Oklahoma. This plateau is well wooded and generally fertile, the soil (with the exception of the sheet of glacial drift above mentioned) being formed from the underlying rock. The plateau, however, includes the Ozark Mountains, whose peaks reach 2000 feet in height, and this mountainous region is unfit for agriculture. The climate is that which prevails in the prairie country to the north.

(43) Arkansas Highlands

South of the Ozark Plateau lie the Arkansas Highlands, a region much lower than the elevated Ozark country to the north. Its surface is much broken by sharp ridges and narrow valleys, closely resembling the Appalachian region described in Par. 18. Agriculture can be carried on in the valleys only. This country is densely forested with pine and has been little developed. There is an abundance of good water power at the points where the streams descend into the plain. The climate is somewhat warmer than that of the Ozark region, but its general features are substantially the same.

THE GREAT PLAINS

(44) Location and Extent

The region of the great plains, or, as it is sometimes called, the Great American Desert, lies between the 100th meridian of west longitude and the Rocky Mountains. Its rainfall, while not sufficient for field agriculture, is ample for forage purposes, so that this section is the seat of a large cattle and sheep industry. The plains are by no means so level as their name implies, large areas being rough and broken by hills. The

streams, moreover, have cut channels of considerable depth, making the surface extremely irregular. In various places, such as the Black Hills of Dakota, the country is mountainous.

The southwestern part of the region is known as the Llano Estacado or Staked Plain, a plateau in northern Texas, which differs from the rest of the plain region in its climate, which is, in summer, extremely hot and dry. The rainfall of this region is at all times uncertain, and stock raising is here a precarious business. It is on the Llano Estacado that the winds are heated which periodically scorch the green crops of the western prairie country, and often extend their influence as far east as Chicago. Were it not for this large surface of hot dry soil, large areas of western Kansas and western Nebraska which have now been almost abandoned as farming lands could be successfully tilled. It has been proposed to cover the surface of the Staked Plain with some quick growing and hardy plant—even weeds such as the Russian thistle having been suggested—so as to prevent the excessive heating of the winds which blow to the northeast and which not only scorch and wither the growing crops of the western prairie region, but sweep away all the moisture in the air which might otherwise fall in rain. The trees of the Great Plain are found along the streams and in the scattered groups of mountains.

(45) Black Hills

The Black Hills of Dakota are the location of a considerable lumbering industry. The summer climate of this region is hot and dry, with a light and variable rainfall. The winters are cold, but because the snow-fall is light, stock is supported without much difficulty in the open ranges. At times, however, violent winds at zero temperature sweep down from the north carrying clouds of fine snow. These storms are called blizzards and always result in great destruction of stock, though in recent years stock men have recognized the necessity of protecting their sheep and cattle and have built sheds for storm shelter so that blizzard losses have diminished.

THE CORDILLERAN DISTRICT

(46) Location and Physical Features

That part of western North America lying between the Rocky Mountains and the coast ranges of the Pacific is in reality a vast plateau, which is in places 1000 miles wide, and which is intersected in every direction by mountain ranges forming valleys and basins of varying size. The rainfall of this region is scanty, nowhere exceeding 20 inches, while in the southern part 12 inches is the general maximum. This rainfall occurs mainly during the winter months in the form of snow, accumulations of which feed the rivers of the region. The soil of the Cordilleran Plateau is fertile, consisting of deep layers of decomposed rock formed partly by glacial action and partly from the disintegration of the underlying rocks. Nearly all the plant food which has been stored up in this thick layer of rock is still present. In a rainy country where springs and rills penetrate every acre of ground, much of the plant food stored up in the soil by the action of nature or by artificial fertilization is constantly being dissolved and washed away.

(47) Irrigation

As an important consequence of the conditions just stated, wherever in the valleys the water of the streams can be conveyed over the soil, the crops are astonishingly abundant. Irrigation is the most certain and profitable of all forms of cultivation. The proprietor of an irrigated farm in the Cordilleran Plateau is certain at all times and in every year of a plentiful harvest. His sunshine is perpetual and for water he need not depend on the clouds. Under these conditions it is no wonder that the yield of irrigated land in the West, on certain crops, is five fold that of the rich soils of the Prairie states, or that as high as \$1000 per acre is often paid for an irrigated farm. Careful governmental investigation establishes the fact that 110,000,000 acres in the Cordilleran region can be put under water.



This is equivalent to 550,000,000 acres of prairie land—an area three and a half times as large, measuring merely by a productive capacity, as the combined area of Ohio, Indiana, Illinois, Michigan and Wisconsin, which in 1900 supported a population of 15,985,581.

Much of this irrigable region has been taken up, but the larger part of the area is still open for settlement. It should be noted that in the northwestern part agriculture is possible without irrigation. In the southwest, on the other hand, the rainfall is too scanty to afford any considerable supply of water, and the entire state of Nevada, for example, must remain in a practically desert condition. In some of the uplands, especially in the neighborhood of the streams, and where forest covering exists, stock raising can be carried on to good advantage. Northern Arizona is the seat of a large stock industry, as is Wyoming also.

(48) Minerals

The mineral deposits of the Cordilleran region are important and widely distributed. All the principal metals except tin are plentiful; and the deposits of coal, although of inferior quality, are abundant and will one day be utilized to support a large metallurgical industry.

THE PACIFIC COAST

(49) Surface and Divisions

The Cordilleran region is bounded on the west by the lofty range of the Sierra Nevada mountains, which in Mount Whitney reach an extreme height of 15,000 feet. West of the Sierra Nevadas lie the Cascade Ranges of Oregon and Washington and several smaller ranges. The entire west coast is divided into a sub-arid region and a region where rainfall is abundant. The former extends from Lower California up to the 35th parallel of latitude. Its boundaries are indicated on the map, page 17. This region also consists of two parts, the area between the Coast Range and the Pacific Ocean, and that which lies

between the Coast Range and the Sierra Nevada mountains and which is known as the Great Valley. The climate of this region is mild and equable, owing to its close proximity to the Pacific Ocean. Its rainfall is scanty, although gradually increasing from south to north.

Here the year is divided into a wet and a dry season, the latter beginning in the late spring and continuing for six months. The nearness of the Great Valley and the Coast Belt to high mountains covered with snow throughout the year makes it possible to supplement the scanty rainfall with extensive systems of irrigation, so that California is one of the most productive states in the Union. The mildness of the climate favors the culture of sub-tropical fruits, which are shipped as far east as the Atlantic seaboard, and the annual yield of the wheat fields in 1900 amounted to 28,543,628 bushels.

(50) Minerals and Forests

The minerals of California are abundant, with the exception of coal, which is of poor quality. Almost all the coal used in the state is imported from Australia, Great Britain and British Columbia. The English coal is brought at very low charges in steamers returning to California for new cargoes and which otherwise would have to return in ballast. Bituminous coal sells in California at from \$6.00 to \$9.00 per ton, and the high price of coal is the most serious obstacle to the commercial development of the state.

The forests of the western slopes of the Sierra Nevada Range and also along the coast belt originally comprised 150,000 square miles. They consisted mainly of redwood trees and the yield of a single acre has amounted to 2,000,000 square feet, board measure. Single trees have yielded 75,000 square feet of timber. The forests of California, as well as those of the Cordilleran range, are an inheritance from a time when the rainfall was more abundant; and when destroyed by fire, as frequently happens to large tracts, it is almost impossible to restore them.

THE COLUMBIA DISTRICT

(51) Industrial Importance

North of California and including a strip of coast 1000 miles long, with an average width of 200 miles, is the Columbia District. Its boundaries are clearly indicated on the map. This is in some respects a region of greater industrial promise than any other part of the United States. The climate of the Columbia country much resembles that of Great Britain, being mild and equable the year through. The rainfall is extremely heavy, reaching an average of 60 inches and in places rising to 100 inches, which is due to the impinging of the moisture-laden winds that blow from the warm currents of the Pacific, upon the Cascade Mountains.

(52) Harbors and Other Resources

The southern part of the Pacific slope is greatly hampered by lack of good harbors. California has only one good harbor, in the Bay of San Francisco; but the Columbia country, in addition to the mouth of the Columbia river, has the great indentation of Puget Sound which reaches deep into the state of Washington and affords a great number of excellent harbors by the sharp curves of its coast. The most ample facilities for over-sea commerce are here present, and the extensive district about Puget Sound also has the advantage of water transportation for domestic trade.

The soil of this region is volcanic in origin with some glacial drift. It is deep, and with the benefits of the heavy rainfall, is very productive. The yield of wheat and oats in Washington is larger than in any other part of the United States. The mineral deposits of this district are extensive, including the more important metals and abundant stores of coal.

(53) Industrial Advantages

An abundance of water power is, however, a more import-

ant advantage for future development than a coal supply, and this is a land of waterfalls. The heavy rainfall tumbles down the steep mountains, furnishing a reservoir of power for future industrial enterprise almost beyond calculation.

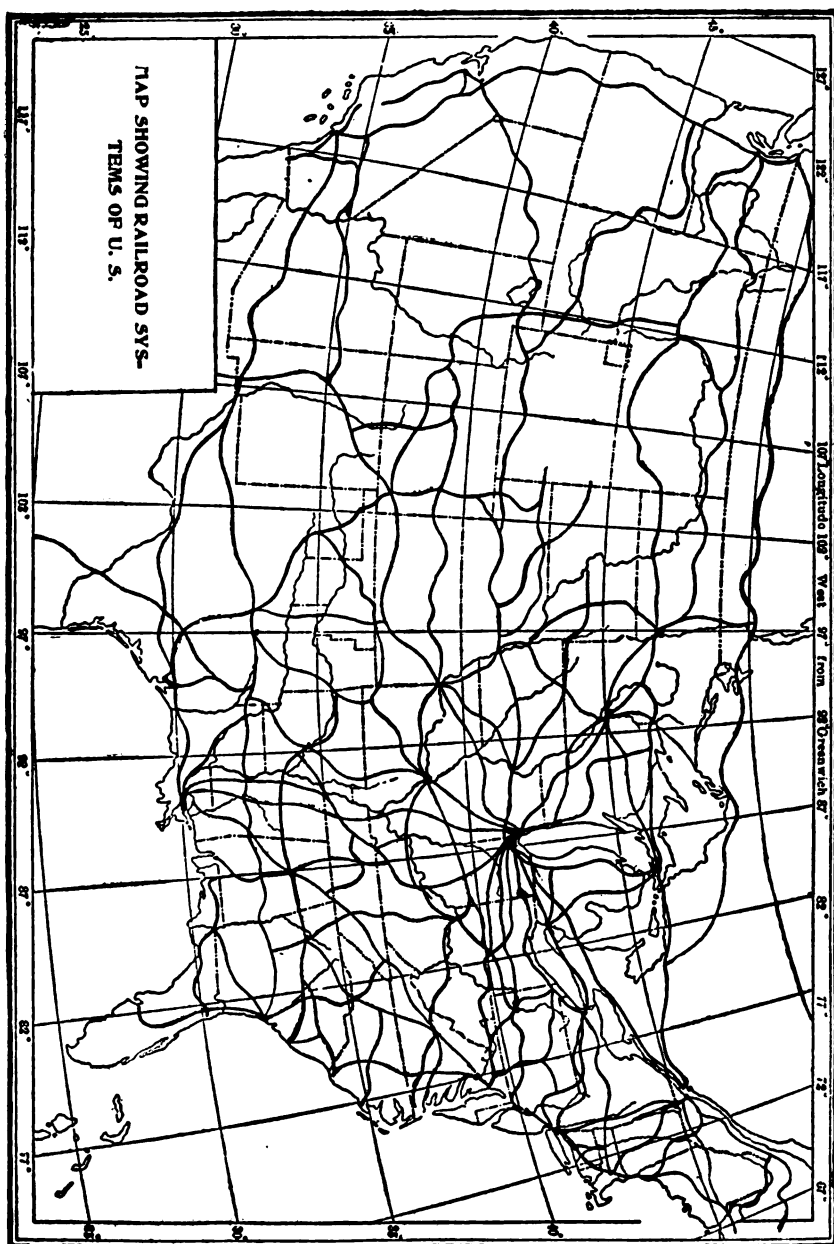
The forest covering of this country is the heaviest in the United States. It is stated that a yield of 200,000 feet per acre is common, and that over an area of 25,000 square miles in Washington 250,000 feet to the acre is a fair estimate. The trees most commonly found are the red fir and red cedar.

(54) Peculiarities

The Pacific Coast Range is peculiar in that it is a world within itself. Separated as it is from the eastern part of the United States by the high mountains of the Cordilleras, it is forced from necessity to become self-sufficient. From the brief account of its resources which has been given, it may be seen that this district has within itself the materials of a complete industrial structure, with the single exception of the group of tropical products, and even of these some are represented. If the Pacific slope is to be joined with any other part of the world in the bonds of commercial intercourse, it will probably be with the Pacific Islands and the mainland of Asia. The Hawaiian Islands, now a part of the United States, already furnish much of the sugar consumed on the Pacific Slope.

(55) General Summary of the Economic Geography of the United States

In order to condense and summarize the ground which has been gone over, let us examine the railway map of the United States on the opposite page. This map shows the location of the principal lines of railway in 1899, by which time the railway system of the country had taken substantially the form it still maintains. The number and direction of the lines in the different parts of the country serve to review and illustrate the geographical features we have just been discussing. Other things being equal, railways will increase in proportion as population is dense and grades are easy. A dense population, except in rare cases, will not be found outside a flat level country which is well suited for agriculture, so that the flat lands and



the railways will coincide. It should not be inferred, however, that productive areas are to be found only where railway lines are numerous. The backwardness of railway development may be entirely due to slow industrial growth, even in regions where natural conditions are favorable.

Another point—railway lines always follow the easy grades, so in a plain country the general direction will be in a straight line and in a mountainous country curves and turns will be numerous.

You will observe first that the railways are few and far apart in northern New England. This tallies with what we have said of the harsh climate and the rough and stony soil of that region. Passing into southern New England, we enter the region of water power and manufacturing and approach the great markets of the West to which these mills send their products. Agriculture is also more flourishing, on account of the milder climate prevailing in southern New England. Farther south, in New York, New Jersey and Pennsylvania, we find an exact accord between the arrangement of the railway lines and the geographical features of the country. These states, it will be remembered, include the Coastal Plain in New Jersey, southeastern New York, and southeastern Pennsylvania. Northwestern New York comprises a portion of the prairie country, and the great valley of the Hudson extends up the eastern part of this state. Along the coast are found the commercial and manufacturing centers of New York and Philadelphia, with the smaller cities adjoining, while in western Pennsylvania is the seat of the iron and steel industry.

Observe how this description is repeated in the railway map. The Coastal Plain, until the sand reaches of southern New Jersey are approached, is a perfect network of railway lines, indicating the presence of a dense population engaged in agriculture and manufacturing. The railways also run up the Hudson River valley and turn directly west at Albany, following the line of the Mohawk valley. In the prairie country of western New York, especially where the commerce of the lakes centers at Buffalo, railways are numerous. In the plateau and Appalachian region, however, where a rough and broken country hamp-

ers the farmer, and where building is difficult, the railway lines decrease in number. In northwestern Pennsylvania, although this highland region is unsuited for agriculture, the presence of a large mining population explains the rapid railway development. Numerous sharp spurs and turns and the general roundabout direction of the lines here, as in the northeastern part of the state, show how mountainous and irregular the country is. The main lines follow the larger streams, and the branch lines run up the small valleys to reach coal mines and the mills depending on them. In western Pennsylvania and eastern Ohio the presence of the iron and steel industry, although this is a plateau region, explains the density of the railway lines. The mountainous character of the country again appears in the twists and turns of the railroads.

(56) The Western United States

Passing now to the West we come into the prairie country. The arrangement of railway lines here, even without the description of this region which has previously been given, would show the character of the country. Practically the entire field is occupied by a dense population. That the country is flat and unbroken appears from the direction of the lines, which are in no place turned aside by highlands or mountain chains. The only change which has taken place in the railway map of this region is in the increasing number of branch lines.

Continuing west from the prairie region, we see clearly shown in the map, the character of the Great Plains and the Cordilleran Plateau. With the exception of the silver mining region of Colorado, and a limited territory about the Great Salt Lake, there are in this section only the great trunk lines which connect the prairies with the Pacific slope. As irrigation and mining enterprises develop, the number of branch lines increases and will continue to do so, though this region can never hope to rival the eastern part of the country in its railway mileage. The railroads of California center about San Francisco and Los Angeles, being almost entirely west of the Sierra Nevada mountains, and indicate where the fertile lands of the state are

to be found. The Puget Sound region and also the western part of the state of Oregon are well supplied with railways, but the greater part of the area of these two states is too arid and barren to support a large population.

(57) Southern States

Passing now to the Southern states, we notice first that the arid plains of west Texas have hardly any railways, while the fertile district which includes the eastern part of the state and the coast line is well supplied. The relatively unfertile regions included in the Arkansas and Missouri highlands are clearly marked out by the absence of railways, the lines which reach the southwest skirting the eastern side of the highland region. The flood plain of the Mississippi is well supplied with railways, the general direction of the lines being north and south. This indicates how successful the railroads have been in competing with the river, owing to the difficulty of its navigation.

Observe next the railway lines in the upland region of the south, starting from northern Alabama and extending up through West Virginia. Nothing could more exactly indicate the relative barrenness of this section than the small amount of its railway mileage. Only in the southern part, including the districts about Birmingham, Alabama, and Chattanooga, Tennessee, where the southern iron industry has been developed, do the lines of railway multiply to such an extent as to prove the presence of a large industrial population. West Virginia and Kentucky are almost entirely dependent on coal and lumber to sustain their railways, and the development of these industries in recent years has caused the railroads in this region to multiply. It will be also observed how the mountainous character of this section is shown by the sharp turns and curves of the railway lines and by the numerous spurs around Birmingham and Chattanooga and the West Virginia region, which show how the railways penetrate the crooked valleys to reach coal, iron, or timber. The central region of the south, lying between the uplands and the coast, has a great number of lines which are sustained by the cotton industry. This region is destined, when its agricultural possibilities shall have been fully

developed, to have as large a railway mileage as the prairie country to the north. But for the exhaustion caused by the Civil War, it would be much nearer solid prosperity than it now is. There can be no doubt but that the abundance of water power, the large timber resources, and the close proximity of coal deposits, combined with the fertile soil and the warm, moist climate, insure to this section a prosperous future.

We come now to the railways of the Atlantic coast and the Gulf Plain, and here we see at once the obstacles which have been interposed to their industrial development by the swamps and sand dunes of these regions. It is to be observed from Maryland to Louisiana that the coast district has few railways. The condition of southern Florida is perfectly described by the absence of railroads in that section. This great region has yet to be reclaimed and added to the productive area of the United States.

PART II.

AMERICAN INDUSTRIES

SECTION I.

(58) Importance of Intellectual Training for Success in Business

In the first part of this book we have passed in review the main geographical features of the United States which have a bearing on the industrial and commercial life of its people. We now enter upon the study of the productive industries of our country, in considering which we shall lay especial emphasis on the reasons for things.

The man who succeeds in business must first of all be a man who can think, reason, and plan. A man who knows merely the routine of a grocery or hardware store, who knows how to keep a set of books, arrange a stock of goods, or make out and send a bill to a customer, has acquired useful information, which will enable him to make perhaps \$40.00 a month. But if this is all he possesses as an equipment for business, he cannot hope to win the highest success. Success in business means much more than a mere knowledge of routine. It implies, above everything else, the power to think independently in one's chosen field, the ability to answer such questions as these: If I am a butcher in a small town in Pennsylvania, shall I accept an agency from Armour and Company, or shall I depend upon the surrounding country to furnish me with my supplies? If I am a miller in Ohio, shall I introduce the roller process or stick to the old method? or shall I change from steam to gas for my power plant? If I have men working for me, shall I pay them just the current rate of wages and work them as many hours as they will work, or will it be economy for me to shorten their hours? If I am a grocer, shall I deal in staples only, or put in a line of fancy goods? If I am a dry goods

dealer, shall I take an agency for a catalogue house or fight the catalogue house with my small capital? These questions and others like them are constantly arising in every business man's experience. The men who succeed in business are the men who answer such questions correctly, and they are also the men who are able to reason and discriminate.

(59) Reasoning Necessary to Success in Business

Now reasoning is, as its name implies, the act or process of finding out the reasons for things. The reasoner constantly asks himself, Why is this fact as it is instead of some other way? His punctuation is all question marks. He may care very little about the way to paint an iron bridge. He may never have a bridge to paint; but he ought to be interested to know why an iron bridge should be painted at all, because if he and his fellow citizens are not informed, the neglect of some county commissioner may cost the tax payers a new bridge. Possibly he cares very little how to make the contracts for stone and gravel for the country road; but he should understand why a macadamized road is needed and why any but the best road is a waste of public money. How to do it is a lesson which must be learned differently in every business establishment and which, if the learner is alert, he is not long in mastering. Why it should be done is a lesson which few ever learn and whose mastery by those who do learn it, and who by learning it achieve success, is a work of years of patient study.

This digression has been necessary in order to explain the plan of presentation which has been followed in our study of economic geography thus far and which will be followed much more closely in the succeeding pages. It will be remembered that we studied the reasons for the advantage of the new world over the old, and of the temperate zone over the torrid zone; the reasons for the existence of water power along the Atlantic seaboard, and for the formation of the prairies; the reasons for the floods of the Mississippi, and for the heavy rains of the northwest coast. We inquired into these things, not merely because they are interesting matters to look into, but because the study of such questions develops in the student the power

to think. So as we proceed with the study of our great industries we shall not take up every raw material nor every form of manufacturing industry, but in those we do discuss, the object will be to show in as great detail as space permits the reason for the facts and processes passed in review, so that, when the student has traversed the limited field set before him, he will be able to think independently upon the different questions as they arise.

(60) General Outline of the Subject

We shall discuss, first, a few of the important raw materials, their nature, location and manner of occurrence, and something of the methods and processes employed in their abstraction. We shall then take up the manner in which these raw materials are provided for the mills and factories that use them. Third, we shall discuss the considerations that influence the location of these factories and some of the principles of their organization and management, confining ourselves mainly to the essentials of good superintendence and management and the relations between masters and workmen. It will be impossible in so limited a space to mention more than a few industries. A careful study of a few will, however, be of far more benefit to the student than a superficial acquaintance with many industries.

THE MINERAL INDUSTRY

(61) Age of Coal

Coal is undoubtedly the most important of all mineral raw materials of industry. In this age of steam-driven machinery, coal represents power, and where nearly every manufacturing process is conducted on a large scale in huge mills and factories, cheap coal is essential to economical production. At every stage of the economic process coal is our servant. It smelts the iron out of which our agricultural, milling, and transportation machinery is made. It transports the grain to the mill and grinds it into flour. It carries the flour to the customer and

finally converts it into bread. Coal weaves our clothing, saws and planes our lumber, fluxes our hard metals into workable condition, and performs for us almost every act and process of our modern life. "This has been called the iron age, and it is true that by its strength, endurance, and wide range of qualities, iron is the material of novelties and is fitted to be the fulcrum and lever of works, while steam is the motive power. But coal alone can produce in sufficient abundance either iron or steam; coal, therefore, commands this age—the age of coal. Indeed, coal stands not merely beside but entirely above all other commodities. It is the material energy of the country; the universal aid; a factor in everything we do. With it, almost any feat is possible; without it, we are thrown back into the laborious poverty of early times."

(62) Nature and Location of Coal

We shall now examine the nature, location and properties of coal. If you pick up a dead leaf and rub it between your fingers, a black stain remains. That stain is the substance from which coal is made. Take a piece of soft coal and carefully separate the layers, and you will probably see upon the surface of the coal impressions of leaves and ferns. The connection is plain between the leaf in the forest and the leaf that millions of years ago left its mark upon the coal. The coal beds are the result of vast accumulations of vegetable deposits, chiefly ferns and club mosses, which in the geological period called the carboniferous or coal age grew to vast size, and formed immense forests over what is now the eastern part of the United States and in many other parts of the world. These forests of ferns and mosses, in the process of time, formed great deposits of vegetable matter, oftentimes many feet thick, spread out in huge layers over the face of the land; and on the surface of these deposits there grew the forests which constantly increased them. It is believed that at that time the land was comparatively low, so that a slight depression of the earth's surface would submerge large areas beneath the water. These depressions of the surface frequently occurred during the carboniferous age—a fact which has been variously explained but which there is no

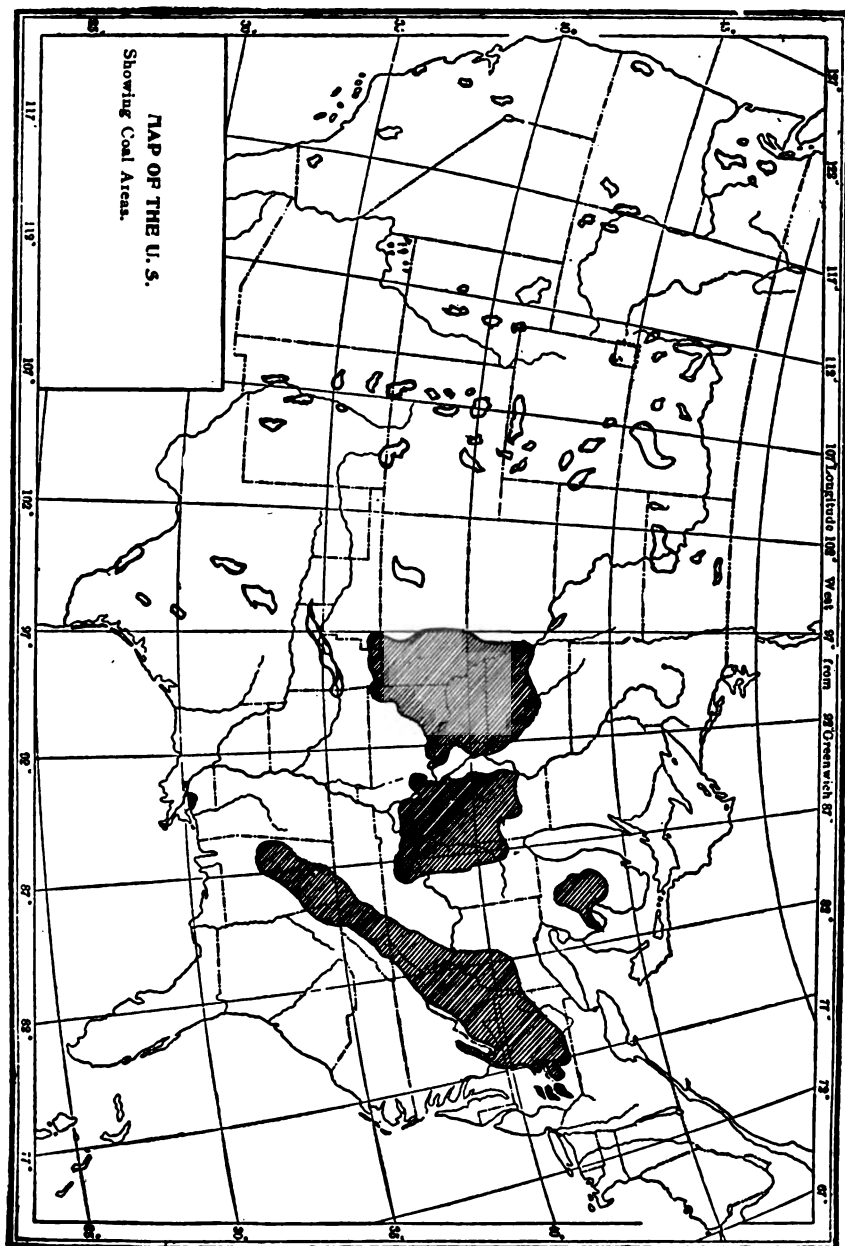
need for us to discuss here—and at every submergence the water would flow over the layers of vegetable matter. The rivers of that time, just as streams do to-day, carried down large quantities of clay and sand together with decayed animal and vegetable matter; and great numbers of little animals, resembling the coral insects, contributed their bony framework to form beds of material very rich in lime.

(63) Properties of Coal

After a time, the accumulation of these materials again raised the surface of the land above the water, and upon that surface a new forest grew up, to be in its turn—and in the same manner as the forest preceding it—carried down beneath the water. In this way, a great many layers of vegetable matter (separated by thick masses of shale, sandstone, limestone and clay), were laid down. In time these materials became so firmly pressed together by the enormous weight of the mass above them that they took on the stone-like form and structure with which we are familiar, particularly in hard coal. This coal consists mainly of carbon, the black material noticed on the leaf and which is very combustible. It also contains a considerable quantity of gas, which is supposed to have been formed from the small resinous cones that dropped from the club mosses of the coal age, the ancestors of our pine trees. Besides gas and carbon, coal contains ash, some water and certain chemical substances, such as phosphorus and sulphur.

(64) Coal Divisions of the United States

Having found what coal is and how it is made, we are prepared to understand the differences between the kinds of coal found in different parts of the United States and how these differences originated. Upon the opposite page appears a map from which it will be seen that the coal deposits of the United States occur in three principal divisions, besides numerous smaller ones. The first division is found in northeastern Pennsylvania; the second includes most of the Allegheny Plateau from Pennsylvania to Alabama, and the third is found in the central and western part of the Mississippi valley.



The question at once arises: What is the reason for this division between the coal regions? We have seen that the coal measures were laid down in large continuous layers over the eastern part of the United States. How, then, did this separation occur? The answer to this question involves an explanation of certain influences which have been and still are at work on the earth's surface.

(65) Separation of the Coal Fields

At some period after the coal measures had been formed, the earth's surface was thrown up or wrinkled in many places. These disturbances affected not only the mountain chains of the Appalachian region, but also the newer formations. The coal strata following the curve of the surface were, therefore, disturbed and uplifted in the same manner. Down the uplands and mountains thus formed, the streams began to flow, and over the northern part of the region passed the glacier of the Ice Age. In this way, by the slow wear of the running water, and by the grinding and cutting of the ice, large areas of the coal measures were scooped out and washed down the streams, leaving the formations as we find them to-day.

(66) Qualities of Coal

Differences in the quality of different coals next concern us. Most people are familiar with the general distinction between the hard anthracite coal of eastern Pennsylvania and the softer bituminous coal of other parts of the country, which now find their way into the eastern part of New England. We all know that hard coal is more valuable than soft coal, and that some soft coals are more valuable than others. For example, hard coal sells in Chicago for \$6.50 per ton, while a ton of Pennsylvania soft coal sells for \$3.75, and a ton of Illinois coal for \$2.00.

The explanation of the high price of anthracite coal lies in the fact that it is hard, and burns without smoke and with a steady flame. These qualities make it the ideal fuel for domestic purposes. As for steam coal, the ordinary explanation is that the higher priced coals will make more steam.

But are these explanations sufficient? Is it enough to take merely the appearance of a thing and then claim to understand its meaning? Let us consider for a moment what the production of heat involves, and we may then understand not only the reasons for differences between the kinds of coal, but also gain some knowledge of their heat producing value.

(67) Combustion of Coal

Heat is the result of the combination of the carbon and gas in the coal (hydrogen) with another gas found in the air (oxygen). The general rule in regard to the heat producing value of coal is: That coal is of most value whose burning produces the largest combination of its elements with the oxygen of the air. Carbon combines with twice its own weight of oxygen, and hydrogen with eight times its own weight of oxygen. It would seem, then, that coals rich in hydrogen—or gas, as we know it, would be more valuable; but we find the contrary to be the case. The coals of central Pennsylvania at the eastern extremity of the middle coal fields average only 18% of gaseous matter, as compared with 40% for some of the western fields, and yet these same western coals command in the Chicago market little more than half the price of Pennsylvania coal. The reason for this apparent contradiction is that unless the precise quantity of air needed for combination with the combustible materials in the coal is supplied to the fuel during the process of combustion, these combustibles are released (and fly up the chimney) without producing any heat. To supply the necessary amount of oxygen is very difficult in burning most soft coals, because, when thrown upon a fire, they almost immediately form a cake, or crust over the top, which interferes with the free passage of air; and it is for this reason that large furnaces have tall chimneys, and that in the locomotive the exhaust steam is discharged violently into the smoke stack to induce a stronger current.

We can now see why a large percentage of gas in coal is a disadvantage, for even this hydrogen gas combines with eight times its weight of oxygen, while carbon combines with only twice its weight of oxygen. In view of the difficulty of supply-

ing sufficient air to insure a good fire at all times, the problem becomes very much more serious in case of gaseous coals. That is to say, the proportion of heat from such coals is smaller than from those in which the carbon element predominates.

(68) Anthracite Coal

It is now possible to classify the coals of the United States according to definite standards of estimate, and to show the reason for the adoption of these standards. The most valuable coal is the anthracite of eastern Pennsylvania. It contains about 90% of fixed carbon; is a very hard coal, which makes it clean and easy to handle; it does not lose its shape in the fire nor does it cake, or clog the grate bars, and the maintenance of an air supply sufficient for practically perfect combustion is possible. For the same reasons, and this fact increases the desirability of anthracite coal, especially for domestic purposes, it is practically a smokeless fuel. Smoke is unconsumed vapor, and almost all the combustible material in anthracite coal is consumed. These facts explain the importance of the anthracite coal industry of eastern Pennsylvania, which in 1900 produced 55,000,000 tons, some of which was sent overland as far west as Omaha and Kansas City, and sold in places at a price of \$9.00 a ton.

(69) Semi-Bituminous Coal

Passing into central Pennsylvania we find what is known as the semi-bituminous coal region, which also extends down into West Virginia. This coal contains from 15 to 20 per cent. of volatile matter and from 75 to 80 per cent. of fixed carbon. Although it is a soft coal, it breaks easily into slack and has a tendency to cake and crust in the fire. Still, its high percentage of fixed carbon and the resulting large amount of heat produced causes it to sell for a good price—\$3.75 per ton in the Chicago market.

(70) Bituminous Coal

Still farther west, we come into the Pittsburg district, which is estimated to contain in one seam alone, called the Pittsburg

or nine-foot seam, 11,000,000,000 tons still unmined. This Pittsburg coal is hard and firm, for soft coal, and is known as bituminous. It runs about 65 per cent. volatile matter. It is peculiarly valuable for making illuminating gas, and on this account, as well as because of its structure it commands about the same price as the semi-bituminous coal, viz., \$3.50 to \$3.75 per ton in Chicago. The central coal field is made up of bituminous and semi-bituminous coals of the same general character as those already described. It is from this region that most of the long distance soft coal shipments are made.

The coal of the western fields is generally much inferior to that of the eastern and middle fields. It is high in volatile matter and low in carbon, and its burning gives rise to an objectionable amount of smoke, soot and cinders. For these reasons it is an inferior steam coal and unfit for domestic use. It commands an average price of \$2.15 to \$2.25 per ton in the Chicago market.

(71) Lignite, or Brown Coal

Passing farther west, we leave the region of the true coals and enter the field of lignite, or brown coal. In order to understand the real nature of this coal, it will be well to explain the reason for the differences already noticed between the coal of different localities. Coal is vegetable matter compressed and solidified and acted upon by heat. The greater this heat and pressure, the harder will be the coal and the higher will be its percentage of fixed carbon. In other words, coal which has had this advantage in its formation will be the more valuable for all purposes. We find that the disturbances that the earth's crust has undergone are less considerable the farther west we go and also that the age of the continent decreases. So that, since the heat and pressure have been greatest in those parts of the United States which are oldest and which have been subjected to the greatest geological disturbances, we have an explanation of the decreasing value of coal as we approach the Mississippi River.

(72) Properties of Lignite

In the lignite of the Western states, we approach the substance of which coal was made. It still contains much of the woody fibre that once formed the substance of all coal, and sometimes trunks of trees but partially transformed into coal are found imbedded in the lignite strata. Its imperfect character is seen also in the high percentage of moisture that it contains, amounting in the case of the North Dakota coal to almost one-third of its weight, while true coal has at most only 5 or 6 per cent. of moisture; and also in the high percentage (40 to 50) of volatile, or gaseous matter, and the relatively small amount of fixed carbon. From what has been said, it will be understood why lignite coal is of greatly inferior quality, and why the industrial development of those sections where it is the only fuel is so slow. On the northwest coast, however, both bituminous and anthracite coal of excellent quality are found, the geological disturbances of this region having sufficed in some places to form true coal by heat and pressure.

(73) Peat and its Characteristics

In concluding the discussion of the coal question, it should be mentioned that in some parts of the United States there are found large deposits of decaying vegetable matter, called peat, mainly consisting of grasses and other plants that occur in swamps and marshes. This material, when cut into blocks and dried, can be burned and is largely used as fuel in Ireland. Peat is the original form of coal, and in the large peat bogs of the southern Atlantic coast we see the first step in the long development which has terminated in anthracite coal, viz.: Peat, lignite, bituminous coal, semi-bituminous coal, anthracite coal—each step marked by increasing hardness, increased percentage of fixed carbon and decreased volatile matter, decreased percentage of water, and increasing value.

The following table presents the production of coal in 1899 by states and territories, in tons of 2240 pounds:

	Anthracite.
Pennsylvania	53,944,647
Colorado and New Mexico	85,889
Total	54,030,536
Middle States:	Bituminous.
Maryland,	4,292,318
Ohio	14,732,384
Pennsylvania	66,205,513
West Virginia	17,190,174
Total	102,420,389
Western States:	
Colorado	4,213,027
Illinois	21,820,553
Indiana	5,362,967
Iowa	4,622,749
Kansas	3,439,524
Michigan	557,775
Missouri	2,701,620
Montana	1,336,117
North Dakota	88,222
Wyoming	3,426,243
Total	47,568,797
Pacific States:	
California	143,725
Oregon	77,579
Utah	701,829
Washington	1,812,394
Total	2,735,527
Southern States:	
Alabama	6,779,836
Arkansas	753,173
Georgia	208,135

Indian Territory	1,372,703
Kentucky	4,113,620
New Mexico	903,707
North Carolina	24,014
Tennessee	2,973,803
Texas	789,136
Virginia	1,880,170
Total	19,798,297

It will be observed on studying this table that the Middle States surpass all other parts of the country in the amount of coal produced. This is due, as has been stated, to the better quality of their coal and to their greater density of population and greater manufacturing development. The states of the central west produce large amounts of coal, but most of it is consumed near the mines, and only a small portion is shipped to any great distance from the place of production. The coal of Pennsylvania, on the contrary, both anthracite and bituminous, is shipped to the head of Lake Superior; and even beyond that point into the western mountains. Finally, the inferior quality of the far western lignite coal is evident from the relatively small amount of its production. The production of coal in any state measures the industrial development of that state, and the backward condition of the far west can be presented in no better way than by showing how small is the yield of its coal mines.

COAL VEIN—MINER AT WORK.





NON-METALLIC MINERALS

(74) Formation

The manner of formation of the non-metallic minerals is in general the same as that of the formation of coal, viz.: (1) The deposit of successive layers of earth and rock material, the building up of banks from the shells and skeletons of minute animals like the coral insect, and the subjection of these deposits to heavy pressure and sometimes to great heat, which often changes their chemical composition and compacts them into more or less solid masses.

(2) The washing out or distilling of solid materials or accumulations of minerals, which are deposited in large bodies either on the surface of the earth or beneath its crust.

(75) Representatives and Their Locations

The principal representatives of this group are stones of various kinds,— clay, salt, soda, sand, cement, mica, asphalt, iron pyrites, sulphur, and petroleum. Most of these substances are well distributed throughout the United States and do not, therefore, require any particular description. Certain materials are, however, more concentrated. Asphalt and bituminous rock, which are chiefly used for street paving, are found in California, Utah, Colorado, Kentucky, and Texas. There are large deposits of soda in the alkali deserts of the far West. In three localities (two in California and the third in Oregon), there are deposits of natural soda estimated to contain 136.2 million tons. Large deposits of sulphur are known to exist in Wyoming, California and Arizona. Most of the cheaper materials which are found in the Western states are at present unavailable because of the lack of transportation facilities.

(76) Petroleum

The most important member of this group is petroleum.

This substance is found near coal deposits and is supposed to have been formed from the bodies of animals enclosed in the coal measures. The domestic output of petroleum in 1900 was 2,300,000,000 gallons.

Until recently, practically the entire yield of petroleum came from Pennsylvania and Ohio. West Virginia has, however, been rapidly increasing her yield, and within the last two years California and Texas have begun to contribute largely to the supply; but the oil produced in these states is of inferior quality and fit for fuel purpose only. There are oil fields in Kentucky and Tennessee also, though these states do not yet produce on a large scale.

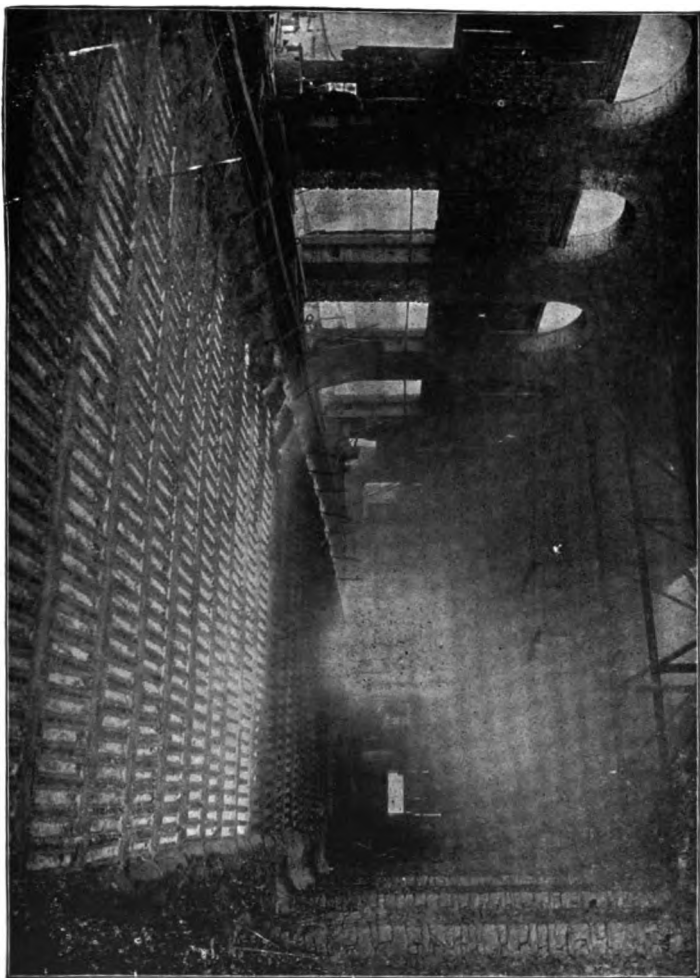
METALLIC MINERALS

(77) Iron

Let us now take up the study of the metallic minerals. Of these, iron is the most important and will be discussed more in detail, while the others, since they are substantially the same as iron in the manner of their formation, will be more briefly described and located. As has been indicated in the study of coal, iron is important because out of it are manufactured the machinery of modern civilization. In the material and industrial sense, this age is pre-eminent, and distinguished above all other ages because of the extent to which it has supplemented and supplanted the strength of human and animal muscles by the powers of nature, which are infinitely more potent.

(78) Natural Forces

The universe about us is a vast reservoir of power. Power almost unlimited is latent in the coal measures which contribute each year to the service of man only the minutest fraction of their stored-up energy. Power is more visibly seen in the rush of the streams and in the heaving tides. The sun is every day pouring great cataracts of power upon the earth. Compared with the power and force of nature, the strength of men



CASTING PIG IRON, BETHLEHEM STEEL WORKS.



and animals disappears. And just in proportion as men have succeeded in getting the mastery of natural forces, of subduing these to their own purposes, and turning them to useful account, has material civilization developed. This task of subjugation is, however, far from accomplished. Only a small fraction of the power available in nature is at man's disposal, but even that small amount is sufficient to lift from his shoulders much of the burden of hard toil, and to increase the efficiency of his efforts a hundred fold.

It requires but brief reflection for the student to realize how prodigious is the contribution of natural forces to our daily life and comfort. Our food, our clothing, our houses and all that they contain, our travel, our recreation and our business, are all conditioned by and dependent upon the use of power. And it is equally easy to understand how all this large use of power is made possible by the use of iron, and of steel, which is made of iron. Boilers, rails, engines, cars, machinery for spinning, weaving, planting, reaping, harvesting, sawing, planing, turning, melting, moulding, forging—in a word, for digging out, cutting down, carrying and transforming the innumerable commodities which we employ in our living and working. All the mechanical equipment of modern civilization is made wholly or in part from iron and steel.

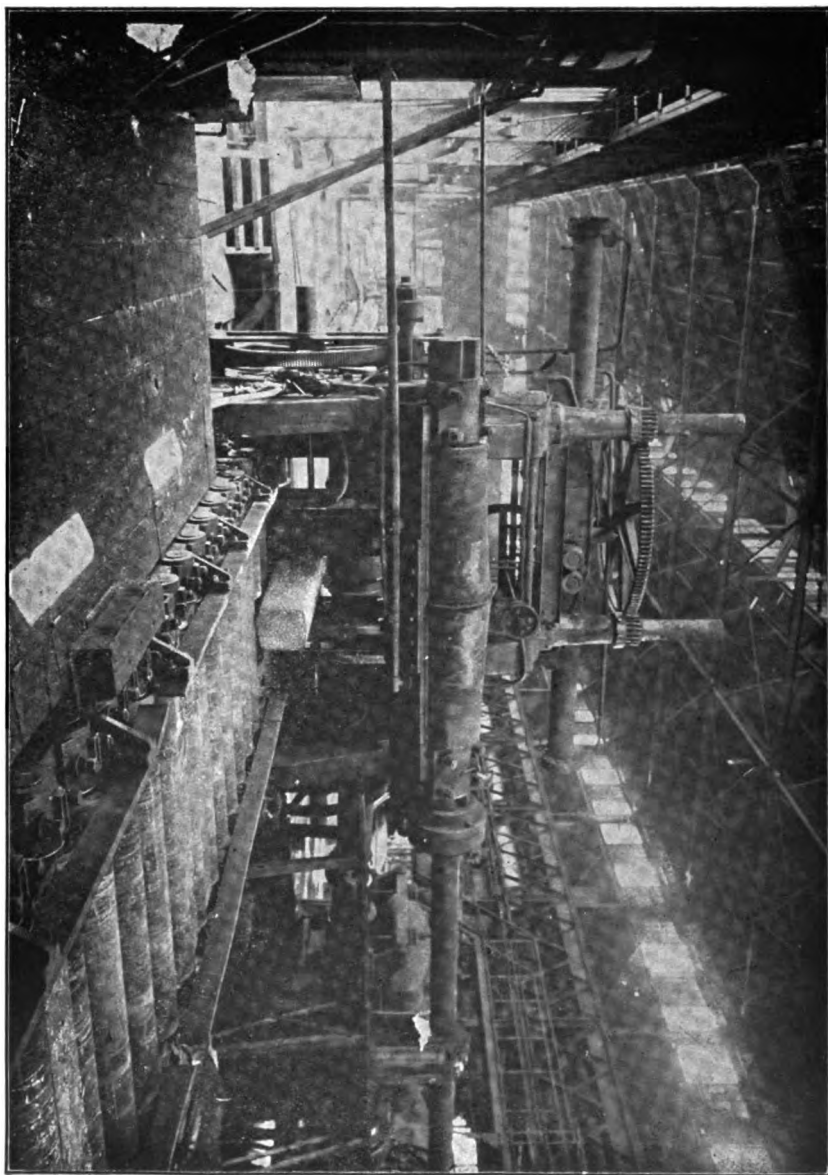
The United States has a peculiar advantage over all her competitors for the world's trade, in that she possesses larger deposits of purer iron than any rival can command. The course of the iron market is the barometer of prosperity, because a demand for anything else implies a demand for iron, and no sooner do men have more money to spend than this increased spending power is reflected in the demand for iron to make the goods that are demanded.

(79) Iron Formation and Occurrence

Iron is supposed, like other metals, to occur throughout the molten mass that is believed to make up the substance of the earth with the exception of a comparatively thin crust upon the outside of this molten center, and in that crust these metallic elements are found also. This iron, scattered throughout

the rocks of the earth's crust, must be gathered into masses before it can be economically mined and worked. The collection of iron into workable form is accomplished something as follows: From one cause or another, either by the action of the weather, or by the contraction of the earth's surface in cooling, or by the slipping of one layer of rock upon another, fissures or crevices are formed in the surface. Into these fissures water penetrates and descends to lower levels. As this water penetrates toward the molten interior of the earth, it becomes heated, and this heated water takes into solution a part of the metallic contents of the rocks through which it passes. These downward movements of water are often turned aside by cross fissures from which they may again return to the surface. Passing upward, the heated water, richly charged with minerals, gradually cools, and in cooling contracts. It is, therefore, unable to hold so much mineral matter in solution, and so deposits the minerals along the sides of the fissures in the order of their weight, the heaviest being deposited first, and the lightest being last released by the cooling of the water. Sometimes it happens that the same crevice contains a number of minerals and metals. Again only one or two may be found. Iron and limestone, being of practically the same weight, are usually found together.

A crack in the earth's crust, filled either wholly or in part with minerals or metals, is called a vein. Sometimes these cavities are filled with iron by the disintegration of the surrounding rocks and the washing away of all but the iron which sinks and fills the cavities. Sometimes, again, the water which holds the iron in solution is evaporated, and in many cases iron ores have been formed by the action of heat, pressure and moisture, in decomposing the rocks in which they occur, without the previous formation of fissures, and by the subsequent arrangement of the older elements in bands.



ROLLING A STEEL INGOT.
By courtesy of the Illinois Steel Company, South Chicago, Ill.



These metallic elements are seldom found in a pure state but are usually met with in various combinations. Observe the radical difference between a seam of coal and a vein of metal. The first is a broad horizontal layer of mineral all ready for use; the second follows an irregular vertical crack, the contents of which must be submitted to a process of melting in order to extract any particular element. Iron ore, for example, contains oxygen in combination with sulphur, phosphorus, clay, iron stone, carbonic acid, etc., and always a percentage of water, and in the production of iron these impurities must be broken down by the action of heat and separated from the useful metal.

(80) Divisions of Ore

A combination of mineral elements in which any one is present in large proportions is called an ore. These ores are, generally speaking, divided into three classes whose names are often seen in popular discussions of the subject, but of whose real meaning few people have any notion. These are (1) magnetites or magnetic ores, that is, ores that have the magnetic quality; (2) hematites, or ores having a large percentage of water; and (3) carbonates, ores having a high percentage of carbonic acid. The most valuable ores, that is, those having the highest percentage of iron in them, are the magnetites and hematites. The carbonate ores are usually of inferior quality.

As might be inferred from the manner of their deposit, iron ores (and other metallic ores also) are always found in the older rocks over which have been laid the newer formations. There are exceptions to this rule, but it holds generally true. These old rocks are found in the United States in the Appalachian and Allegheny regions, in the Ozark Highlands, around the head of Lake Superior, and at different places throughout the district of the Great Plains, the Cordilleran Plateau and the Pacific coast. By examining the map of the iron region of the United States, it can be seen how closely the occurrence of iron ores corresponds to the location of the older rock formations. For reasons that will be given in another place, the iron deposits at the head of Lake Superior are at present the most important.

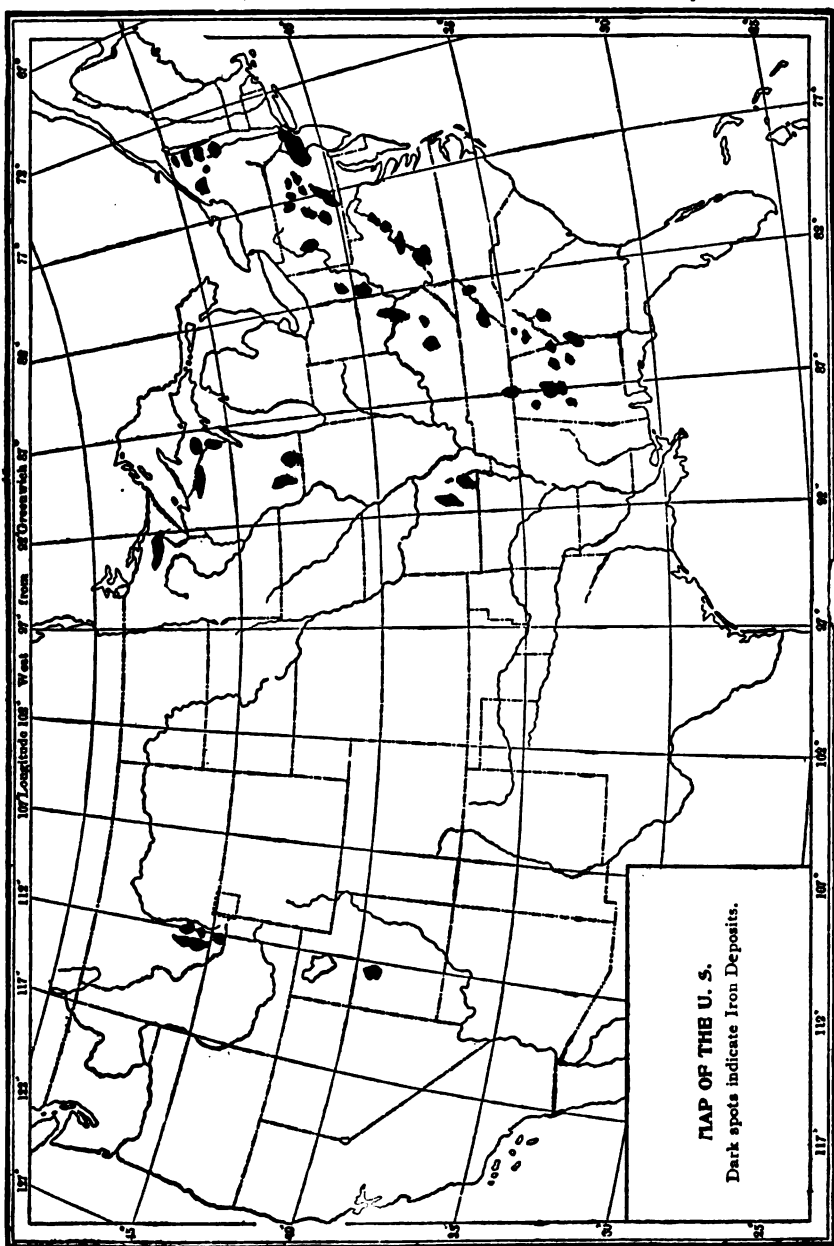


Table showing production of pig iron in various states during the calendar year 1899.

State	Tons (2240 lbs.)	State	Tons
New York	} .. 391,944	Georgia	17,855
and		Alabama	1,083,905
New Jersey	} .. 391,944	Ohio	2,378,212
Pennsylvania		Illinois	1,442,012
Maryland	6,558,878	Wisconsin	203,175
Virginia	234,477	Colorado	138,880
West Virginia ...	365,491		
Kentucky	187,858		
Tennessee	119,019	United States	13,620,703
	346,166		

A study of the foregoing table shows the great superiority of Pennsylvania in the production of pig iron, and also that a large proportion of the total product is obtained from Lake Superior ores, as in nearly all the pig iron produced in Pennsylvania, Ohio, Illinois, and West Virginia is derived from the Superior mines. Observe also how small an amount of pig iron is produced from the seats in which the iron ore is found. Wisconsin and Minnesota, for example, produce less than 200,000 tons of pig iron. The importance of nearness to market, and the relative difficulty of transporting coke is illustrated by the small production of these upper lake states.

OTHER METALS

(81) Names and Uses

Next to iron, the most important metals produced in the United States are lead, zinc, and copper. These furnish materials for a variety of manufacturing industries.

Lead forms the basis of the manufacture of paint. Peroxide of lead, also called litharge, is used in the manufacture of flint glass, and in the glazing of pottery. It is the raw material of

the plumbing industry, and in two forms of alloy (pewter and solder) is used in many other manufactures.

Zinc is used to make brass, and in copper sheathing. It is also used in the manufacture of paint, in electrical manufactures, and in the galvanizing of iron and steel.

The applications of copper are more numerous than those of lead or zinc. Copper is used in the manufactures of wire, brass, boiler sheathing, vitriol, German silver, sulphuric acid, and to a very large extent, in house construction and furnishing. The most important application of copper is in the electrical industry, to every branch of which it is indispensable.

(82) Location of Lead and Zinc

The location of these metals is chiefly in the West. Deposits are found in different parts of the Appalachian region, but not in sufficient abundance to make their development profitable. The central portion of the Mississippi Valley, particularly southwestern Missouri and northern Arkansas, contains large deposits of zinc and lead ore. The zinc industry of Missouri is more important than that of any other state, as is the lead industry also. Western Illinois contains considerable amounts of lead ore, but these are no longer worked on a large scale. These metals are found in abundance throughout the Cordilleran district, but, owing to the great distance from markets and their cheapness, they are produced only when found in connection with silver. In this case, the zinc and lead must be separated in order to secure the more valuable silver, and the baser metals are sold for what they will bring, thus reducing the cost of production of silver. Lead and zinc are always found in combination with other substances and must be separated in much the same way as iron.

(83) Location of Copper

Copper occurs in workable amount in the northern peninsula of Michigan, where it occurs in the pure state. It is also found throughout the Cordilleran region, where it is extensively mined in Montana and Arizona, but here it occurs in the form of a true ore and must be smelted in the same manner as other metals.

The high price of copper, often reaching 16 cents as compared with 3 cents for lead, permits smelting of straight copper ore in the neighborhood of the western mines and its subsequent transportation to the eastern markets. A great drawback to all metallurgical industry in the west, however, is the scarcity of fuel, which must be brought from great distances. The price of coke at Connellsville is \$2.00 a ton, but the copper smelters of Arizona are often compelled to pay \$18.00 a ton for it. The following table shows the production of these three metals in the districts of largest output:

Production of Copper, Lead and Zinc in Various Parts of the
United States.

Copper.

Name of District	Pounds
Lake Superior region	101,410,277
Arizona	34,796,689
Montana	112,980,896
Other States and Territories	10,576,230

Lead.

	Short Tons
Colorado	40,576
Idaho	58,627
Utah	40,537
Missouri, Kansas, Wisconsin	54,542
Illinois, Iowa, Virginia	56,542
Other States and Territories	26,217

Zinc.*

	Short Tons
Eastern and Southern States	4,650
Illinois and Indiana	22,129
Kansas	21,464
Missouri	10,371

*Figures of production fail to correspond with location of deposits, because of shipment of ores to other states for smelting.

THE RARE METALS

(84) Kinds and Location

Under this head are included the following: Nickel, manganese, used in the manufacture of steel; quicksilver, used in the extraction of gold and silver; and carborundum and bauxite, from which aluminum is made.

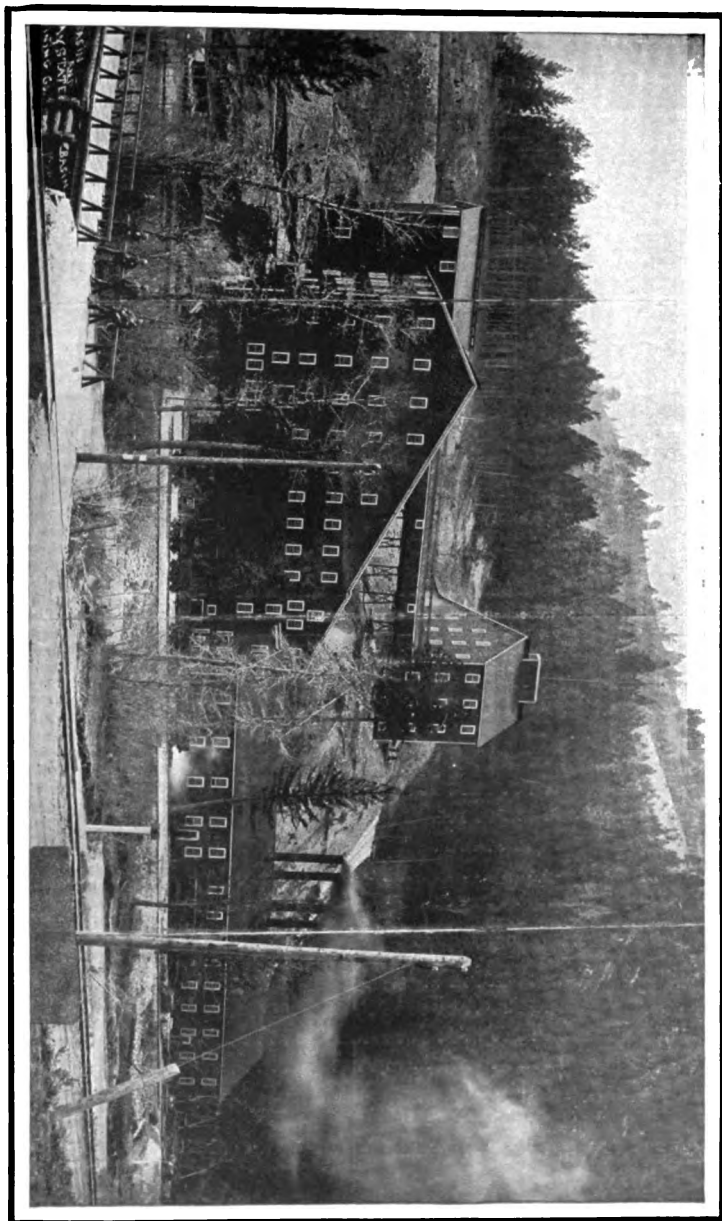
Deposits of nickel are known to exist in Nevada and Oregon; manganese is found throughout the Cordilleran region; quicksilver is produced only in California, where it is abundant; and carborundum and bauxite are found in many places in the Appalachian region, especially in Georgia, Tennessee, and North Carolina.

(85) Gold and Silver

The most important of the rare metals are gold and silver. The value of the gold produced in the United States in 1899 was \$710,053,000, and of the silver, \$32,859,000. Gold is almost unique in that it is always found in a pure state, the only other exceptions being copper, rarely found pure, and silver.

Gold is sometimes found as flakes or small veins in rock, in which case the rock is crushed to a fine powder and the gold extracted by the use of quicksilver. Sometimes, however, another method is used—that of passing an electric current through a solution containing cyanide of potassium into which the crushed gold ore is fed, when the gold is deposited on metal plates by the action of the electricity. Gold is also found “free” in the sands of streams where it has been carried by the water after having been washed out of the rocks which originally contained it. When gold occurs in this form it is separated by subjecting the gravel or sand to the action of running water, which washes away the other substances.

Silver sometimes occurs in the pure state in the rock matrix, in which case it is treated with quicksilver; or more often, in the form of true ore in combination with other substances,



A GOLD MINING PLANT.



and is then separated by smelting in the same manner as other metals.

The production of gold and silver by states and territories is given below.

Production of Gold and Silver in various States and Territories of the United States (coining value) 1899.

	Gold.	Silver.
Alaska	\$5,459,500	\$181,140
Arizona	2,566,100	2,040,630
California	15,197,800	1,065,762
Colorado	25,982,800	29,301,527
Idaho	1,889,000	4,980,105
Montana	4,760,100	20,810,990
Nevada	2,219,000	1,090,457
New Mexico	584,000	650,731
Oregon	1,429,500	173,641
Utah	3,450,800	
Washington	3,685,400	330,990
South Dakota	6,469,500	672,323

From the foregoing table it appears that Colorado and California are the chief gold producing states, and Colorado and Montana those producing most silver. In Colorado silver is mined chiefly in connection with lead, and in Montana in connection with copper.

SECTION 2.

AMERICAN INDUSTRIES (Continued)

(86) Wheat Industry

In entering upon a discussion of the agricultural raw materials, we naturally take up wheat as being of the first importance, since it is the chief bread grain of the white race. Upon page eighty-seven appears a map showing the wheat production of the United States. A study of this map will show the surprising fact that this country is not by nature suited for the

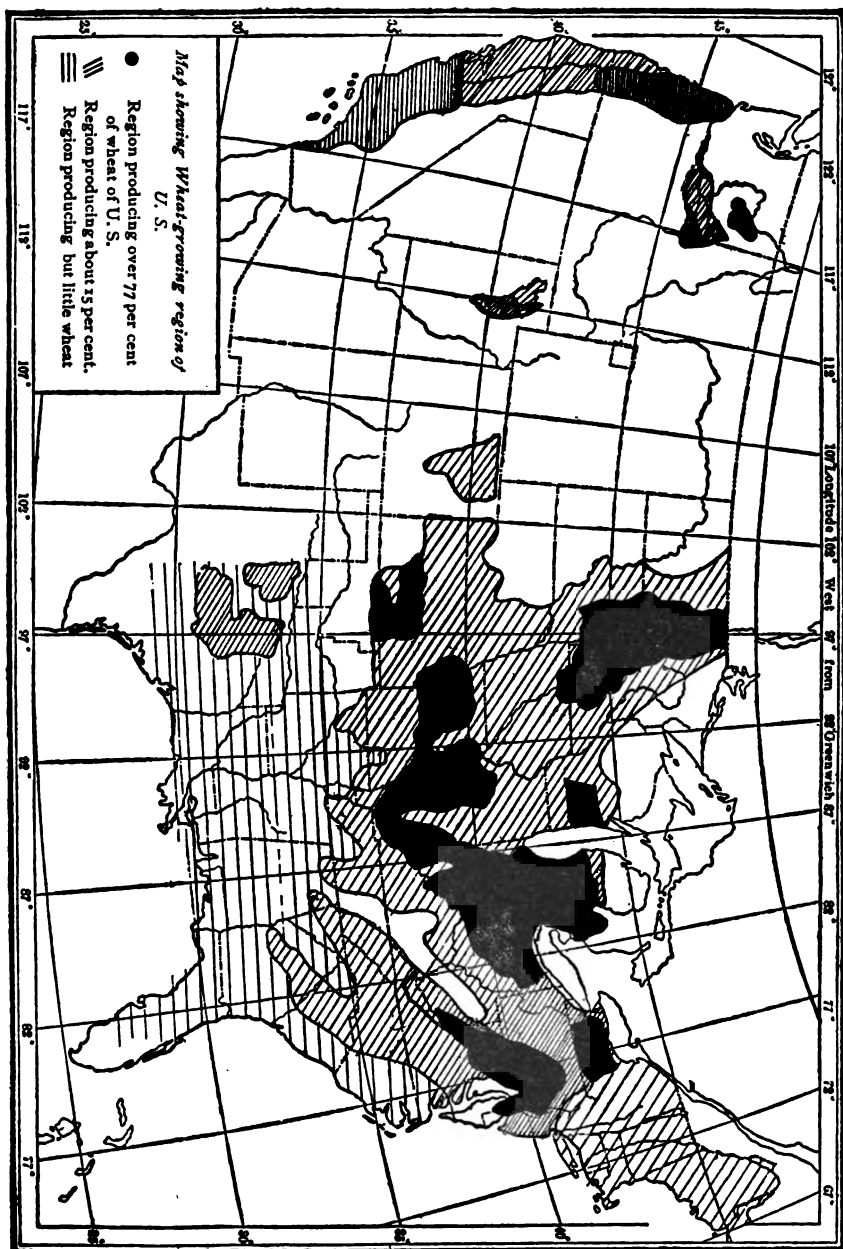
growing of wheat, and that as our population increases and our industries become more diversified we may expect to see the importance of this branch of agriculture decrease. The study of our position as a wheat growing nation will also show us what the conditions are upon which successful wheat growing depends.

(87) Wheat Producing Sections

The total wheat crop of the United States in 1899 was 547,303,000 bushels, produced in every state of the Union, but in widely varying quantities from one section to another. Thus, of this total of 547,000,000 bushels, only 136,000 bushels were produced in the New England States—less than two-tenths of 1 per cent.; 40,911,000 bushels, or approximately 7 per cent., were produced in the Middle States; 44,640,000 bushels, approximately 8 per cent., were produced in the Southern States; 104,787,000 bushels, or 12 per cent., were raised in the Mountain States and the Pacific States, while 356,828,000 bushels, or 69 per cent., were produced in the Western States and Territories. This division is represented upon the map by the difference in shading. In 1889, out of a total crop of 415,000,000 bushels, the Western States and Territories produced 272,000,000, or 65 per cent.; the Eastern and Southern groups of states each produced 9 per cent.; and the Pacific States and Territories produced 59,000,000 bushels, or 14 per cent.

(88) Climatic Conditions of Wheat Culture

It may be seen from these figures that during the period 1889-1899, there has been but little change in the rank of the different states as wheat producers, and that the grain belt can be fairly well defined. The section of the country which produces three-fourths of the wheat of the United States, includes the entire area lying between the 38th and the 44th degree of latitude. The mean annual temperature of this region is between 45 and 55 degrees, the July temperature being between 70 and 80, and the January temperature below 30 degrees. The rainfall is between 35 and 50 inches. Practically the entire wheat crop of the United States is grown in regions where the



annual rainfall is above 25 inches—during the growing season being from 15 to 25 inches, and at an elevation of less than 1500 feet. Geologically considered, most of the wheat is grown upon the drift or glacial soils.

(89) Conditions Necessary for Successful Wheat Culture

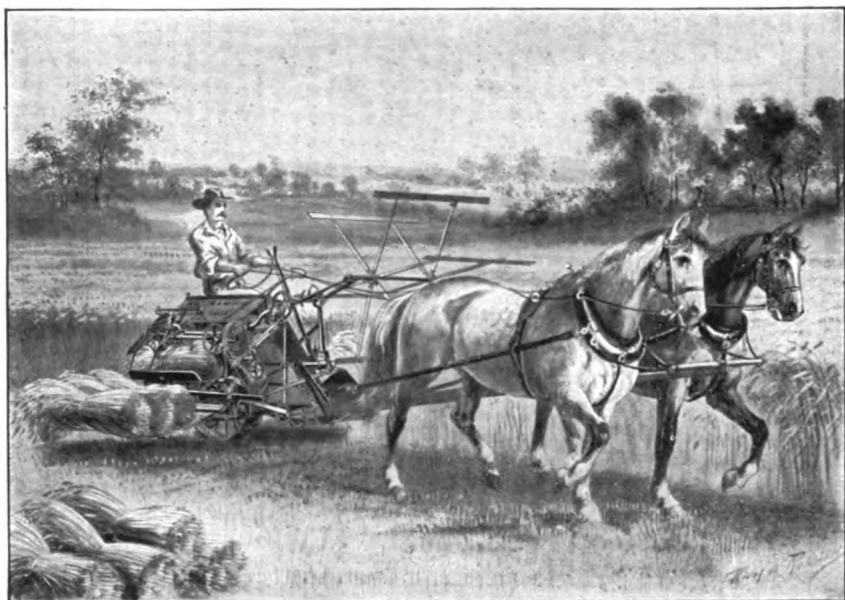
Eliminating the last two factors as being in themselves of secondary importance—that is to say, depending upon other influences, we may infer certain things regarding the best localities for wheat production and the nature of wheat culture. It is evident from the location of the crop that wheat must have an abundant rainfall during the growing season and a high temperature during the ripening season. Other considerations are of minor consequence, but climate is all important. The ideal climate for wheat growing is one with a long and rather wet winter with little frost, prolonged into a cool and wet spring which in turn passes into a warm and dry summer. The reasons for this are as follows:

1. Extreme cold kills wheat in two ways; either by chilling it, or heaving it out of the ground. Where there is a winter temperature below the freezing point, therefore, an abundant snowfall is necessary to keep the plants from frost.

2. A cool, moist, growing season is necessary to a large yield, because only a single head is produced for each stalk. The plant, after it has first started from the seed, branches just at the surface of the ground, sometimes forming ten plants, each with its own set of roots. After the plants have topped the ground, this process of branching or "tillering," as it is sometimes called, is arrested; so that on this account a cool spring is necessary to the largest yield of wheat. The warmer and dryer the spring, the more rapid will be the growth of the wheat plant, and consequently the fewer the stalks and the ears.

(90) Other Factors in the Growing of Wheat

After the wheat comes into head, however, more sun and less rain are needed, because an excess of rain produces such diseases as rust and mildew. Furthermore, a hot ripening sea-



HARVESTING WHEAT—THE OLD WAY AND THE NEW WAY.



son makes the wheat more nutritious since it increases the amount of gluten which is its most valuable food element.

The truth of these principles of wheat growing is proved by the yields of the different states. The climate of the state of Washington, for example, comes nearer to the standard which has just been set as the ideal condition of wheat culture than that of any other state. The wheat yield of Washington should, therefore, be the largest of all, and such we find to be the case. In 1899 the wheat crop of this state averaged 24 bushels to the acre, while the average for the entire United States was only 12 bushels to the acre. The wheat crop of Great Britain, which has a better wheat climate than that of Washington, averaged in 1899, 34.75 bushels per acre, a part of which was no doubt due to superior methods of production.

We reach, then, the rather astonishing conclusion that, measured by the highest standard, the great wheat growing region of the United States is not particularly well adapted to the growth of wheat. This is shown by the yield of particular states, the yield per acre in North Dakota, with a total output of 37,700,000 bushels, being only 14.7 bushels per acre; of Minnesota with 68,200,000 bushels, 13.6 bushels; and Kansas with 36,000,000 bushels, 9.8 bushels to the acre. Of the Eastern States, New York has an average yield of 18.2 bushels, largely due to its more abundant rainfall. The dominating factors in the location of wheat production in the United States are thus seen to include something besides mere climate.

(91) Influences which Fostered Wheat Growing in the Mississippi Valley

The main influence which has forced our agriculture into wheat growing has doubtless been that the soils of the Western States, the great centers of wheat culture, are sufficiently rolling for natural drainage and at the same time are level enough to admit the use of field machinery. The fact that all of this land was practically given away also accounts in large measure for the location of wheat culture here. Again, the larger yields of good years* encourage the grower to believe that all years

*The wheat crop of Kansas, for example, being valued at \$40,000,000 in 1891 and \$36,000,000 in 1892, while in 1893, 1894 and 1895 it ran down to 9.7 million, 15.5 million and 10.3 million respectively.



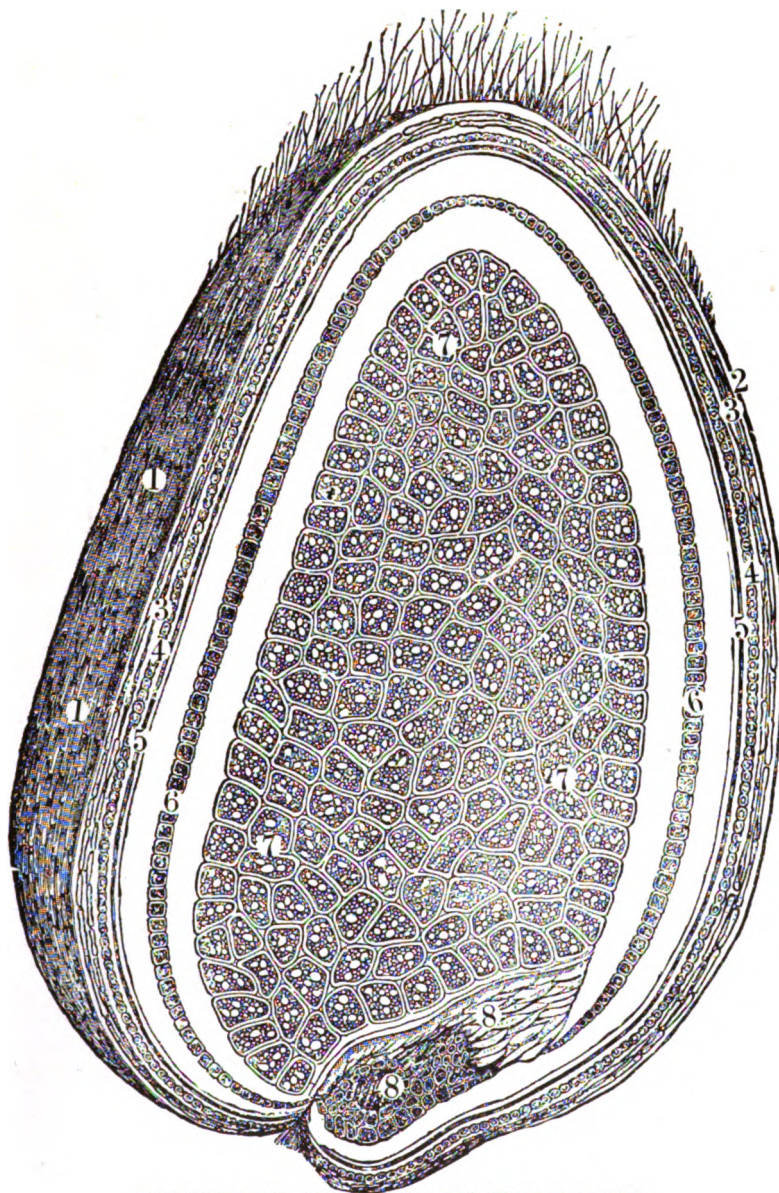
will be good years and keep him growing wheat. Then, too, the fact that what has been the grain in largest demand by the Eastern States and by Europe helps to explain its cultivation on such a large scale in the West.

Taking the four states of largest production in 1898—Kansas, Minnesota, North Dakota and South Dakota, we find that their total yield in that year was 240.9 million bushels, of which 184.8 million bushels, or 76 per cent., were shipped out of the country where it was grown. It will thus be seen how dependent these states were upon their wheat crop to pay their debts and purchase other commodities. Wheat was the product which offered the largest immediate return, and, although the conditions did not particularly favor the cultivation of wheat, it was taken up on a large scale throughout the West. With the growth of a demand for garden stuff, dairy and other products, the culture of wheat will, however, undoubtedly decline in importance. The most remarkable illustration of the tendency to abandon the culture of wheat where natural conditions do not favor it, is furnished by the state of Illinois. In 1880 that state devoted 3,256,000 acres to wheat and in 1898 only 1,911,000 acres. The wheat crop in 1880 was 56,508,000 bushels; in 1898, 18,383,000 bushels.

(92) Shift in Location of Wheat Industry Since 1870

During the last thirty years the location of the wheat industry has shifted to the Northwest, and instead of winter wheat being almost the sole crop, spring wheat has now come to assume first place. These changes in the location of the industry and in the kind of grain produced can be largely accounted for by a revolution in the methods of manufacturing flour.

The nature of flour production can be understood by studying the structure and contents of a grain of wheat. The hull of this grain is composed of two layers, one enclosing the other. Its general consistency is that of straw. The endosperm, or floury portion, is composed of large cells in which grains of starch are found. The center of the endosperm is the softest part, containing relatively the least gluten and the most starch. It is the part which pulverizes most readily and gives the most finely powdered flour. This flour makes a dough with but little



LONGITUDINAL SECTION OF THE WHEAT BERRY.

Explanation: 1. Superficial side of the crease. 2. Epidermis, or hull. 3. Epicarp. 4. Endocarp.
 5. Episperm; cells containing coloring matter. 6. Embryous membrane.
 7. Endosperm, or floury portion. 8. Embryo, or germ.



strength, owing to the small amount* of gluten it contains. The layer which surrounds the center is richer in gluten and harder. Its weight is 1-5 that of the whole berry.

The layer immediately in contact with the bran layer or hull is the richest of all in gluten but adheres very closely to the bran and is with great difficulty separated. The bran, of course, has no nutritive value, being composed of cellulose which cannot be utilized by the human system. The germ is rich in phosphorus and is surrounded by a number of fatty cells. Some authorities contend that this germ should be retained in the flour, but the general practice has been to eliminate it.

Understanding now the structure of the endosperm of the wheat berry, we find it to be formed of floury layers of cells arranged in concentric circles and increasing in richness from the center. The object of the flour making process is to eliminate all material outside of the endosperm, but to retain as much of that as possible.

(93) Old Process

The first method of making flour which was generally employed in the United States is known as the old process, and is still in use in some towns. It consists of crushing the grain between two flat stones set so closely together that the distance between them is less than the diameter of the wheat berry, the lower stone being fixed and the upper stone revolving upon it. The millstones are usually made of porous sandstone; the upper one having an opening through which the grain is fed down between the stones, and the lower one being provided with channels for the escape of the meal. It is highly necessary to the perfect grinding of the grain that the upper stone be exactly balanced in a horizontal position, and that each stone have a perfectly plane surface. To this end the stones must frequently be dressed off with a small steel pick, an operation requiring them to be taken apart and reset. The speed ranges about 250 revolutions a minute.

The second part of the process is the bolting, or separating the flour from the bran and other coarse material. The machine employed for doing this is called a bolt and consists of a

cylindrical frame of wood 18 feet long and 30 inches in diameter, covered with silk cloth. Four of these frames are enclosed in a bolting chest in such a way that when the granulated material is fed into the top, the bolt can be so agitated as to sift the material, the fine flour passing through the bolt and the bran remaining behind. The great objection to the old process was that it either gave flour which was too weak or which contained too much bran, according as the grain was coarse or fine ground.

(94) New Process

The essential difference between the old process and the new is that, instead of the reduction of the wheat to flour being performed in one grinding, several grindings, sometimes even six or eight are now required. The grain is first roughly ground, the stones, or the steel rollers being set farther apart than in the old process, the object being merely to separate the endosperm from its covering of bran. The granulated wheat is then bolted or sifted to separate the bran, the ordinary appliance being now a circular hopper, covered with silk, which is kept rapidly revolving. The purified middlings are then ground and sifted a second time and the lowest grade of flour, the softest and least valuable part of the grain, is separated. The middlings are again ground and sifted, at each successive reduction a finer quality of flour being produced until, at the final grinding, the finest grade of patent flour is turned out. The successive grindings going out from the center reduce successive layers of cells in the endosperm, each successive layer increasing in hardness and tenacity, and in its percentage of gluten content. The different grades of flour with which every one is familiar are in this way produced.

(95) Different Grades of Flour

Each grade is kept separate and sold under a different name and for a different price; as "extra," "clear," "patent," "straight"—all descriptive of Minneapolis flour, the "patent" being the finest made, and frequently commanding a price much higher than that of the "straights." The general introduction of rollers into mill practice is without special significance so far

as the production of fine flour is concerned, the object of this change being merely to increase the durability of the grinding surface and to set the rollers more accurately than was possible with the stones.

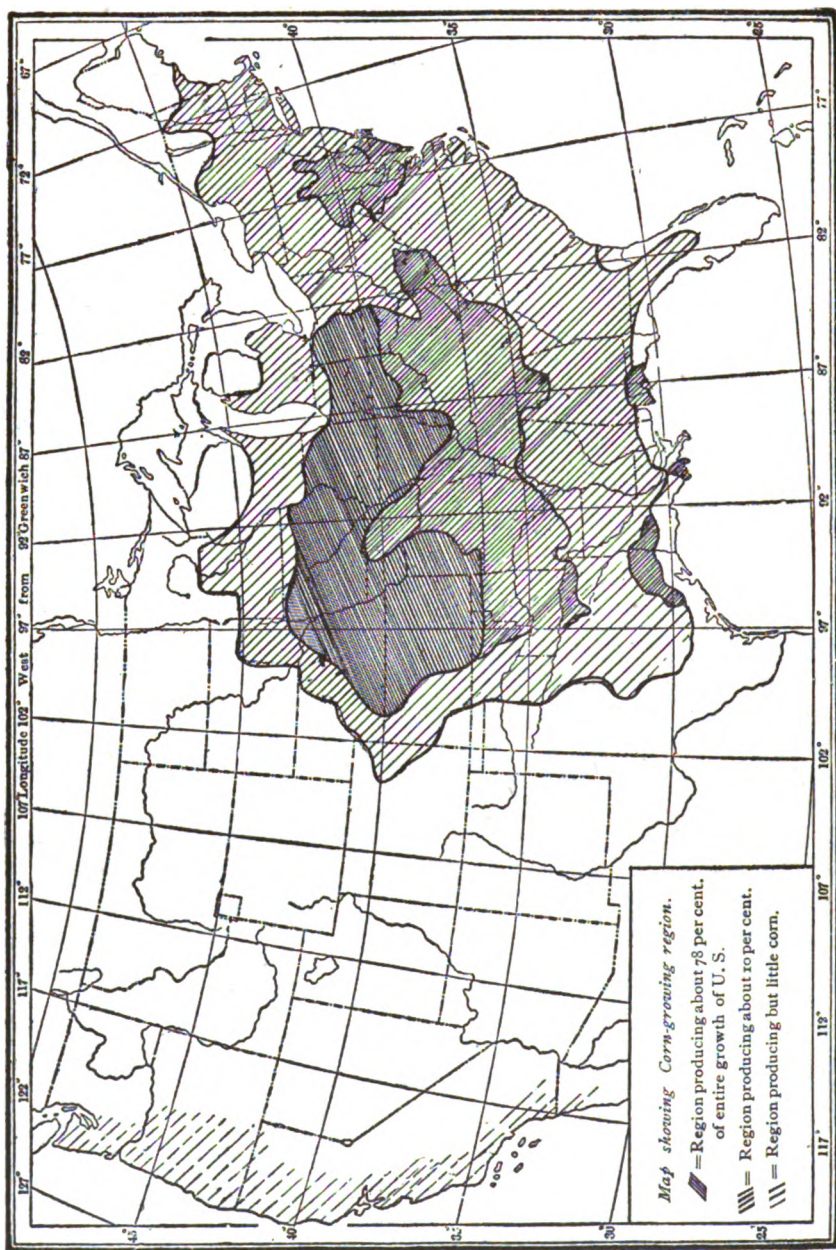
(96) Hard and Soft Wheat

The introduction of the gradual reduction process has revolutionized the grain trade by making possible the utilization of the hard wheat of the Northwest. This was richer in gluten than the softer winter wheat, but had a hard, brittle hull or bran which became mingled with the particles of the endosperm and could not be bolted out. The flour made from it was dark colored and of inferior quality to that made from winter wheat whose hull is tougher, resisting grinding better, and being more thoroughly parted from the flour. Hard wheat commanded a low price as compared with winter wheat, sometimes selling at 20 cents a bushel less, and the price of flour made from this wheat was also proportionately reduced.

By the gradual reduction process, which has now become almost universal, the positions have been reversed; hard wheat commands a much higher price and patent flour is the finest grade sold. A rough crushing separates the brittle bran, and the endosperm, far richer in gluten than that of the winter wheat, is thus made available. This fact accounts in large measure for the shift of the centers of wheat production to the northwest. It also accounts for the gradual change from winter to spring wheat, which is going on throughout the West, the wheat crop of Kansas, for example, having gone over very largely to the hard spring wheat. In 1898, out of a total flour production for the United States of 23.7 million barrels, 14.2 million were produced at Minneapolis, and a large part of the remainder was produced out of hard wheat.

(97) Corn

The corn crop of the United States is of greater industrial importance than the wheat crop. In 1900 the value of the corn crop was \$751,220,034 while the wheat crop brought only \$323,515,177. Corn is important, however, not because it is directly used to any great extent as food for man, but because in the



form of beef and pork it forms such a large part of the national food supply. The corn map of the United States appears on the opposite page. As in the discussion of the location of wheat, we shall study the nature of the plant and its climatic limitations.

(98) Extent and Location of the Corn Crop

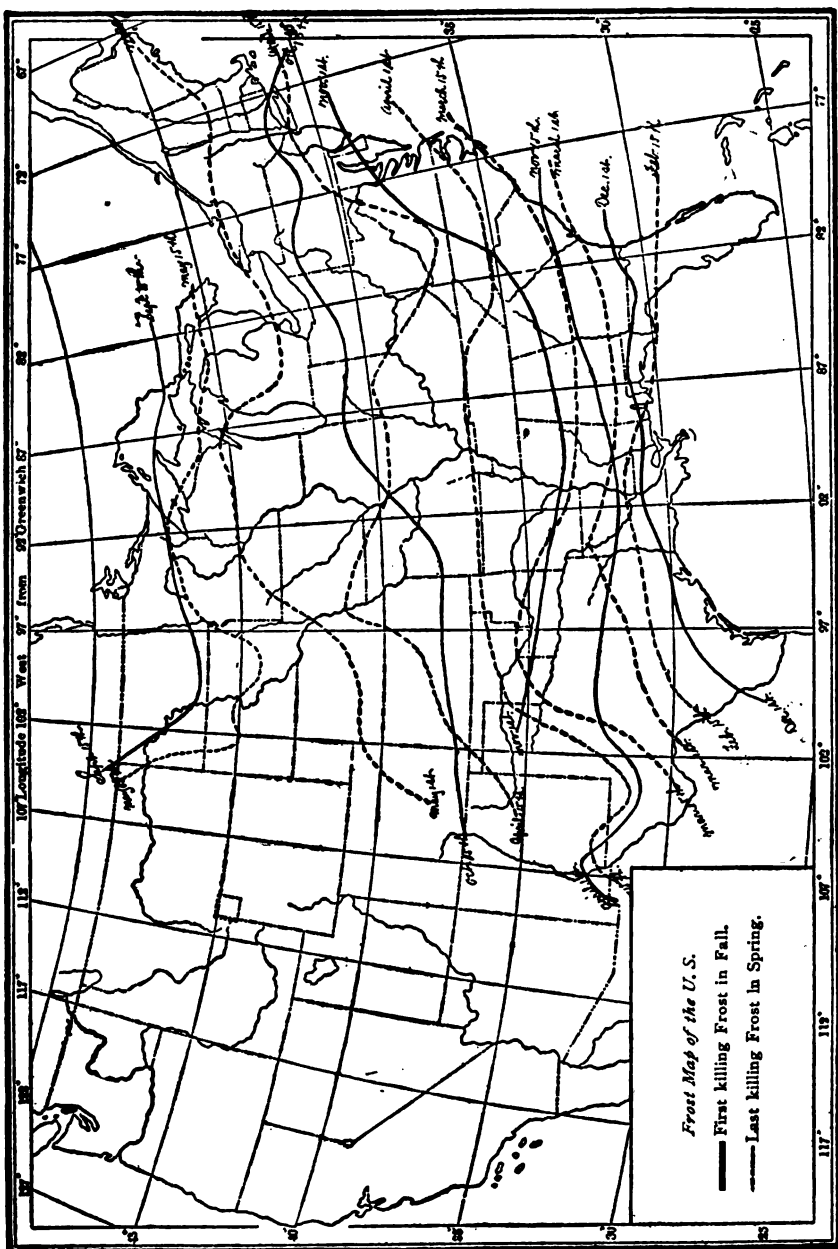
The corn crop of the United States in 1899 was approximately two billion bushels. Of this amount 6.6 million bushels were produced in the New England States, 70.2 million bushels in the Middle States, 510.5 million bushels in the Southern States, 556.2 million bushels in the North Central States, 898.3 million bushels in the Trans-Mississippi States, and 77.3 million bushels in other states and territories. The bulk of the crop of 1145 million bushels was raised in five states—Illinois, Minnesota, Iowa, Kansas, and Nebraska, and these states, with northern Missouri and portions of Indiana and Ohio, may be considered as constituting the corn belt.

The general distribution of the crop throughout the eastern part of the United States and especially throughout the South, indicates what is in fact true—that corn is distinctly the American grain and that it has almost unlimited power to adapt itself to new conditions. The Corn Map on the opposite page should be studied in connection with this discussion, as well as those on pages 98 and 100, showing the dates of early and late frosts and the average rainfall.

(99) Ideal Conditions for Corn Production

The ideal climate for corn is one with a summer four and a half months long, the middle portion hot, both day and night, with rains sufficient to supply the wants of a rapidly growing crop, and falling at such intervals as to provide moisture without making the soil actually wet. It will be observed from the accompanying maps that the location of the corn crop very closely follows this rule.

More than seven-eighths of the crop grows where the July temperature is between 70 and 80. Corn is not, however, well suited to a tropical or sub-tropical temperature, and on this ac-



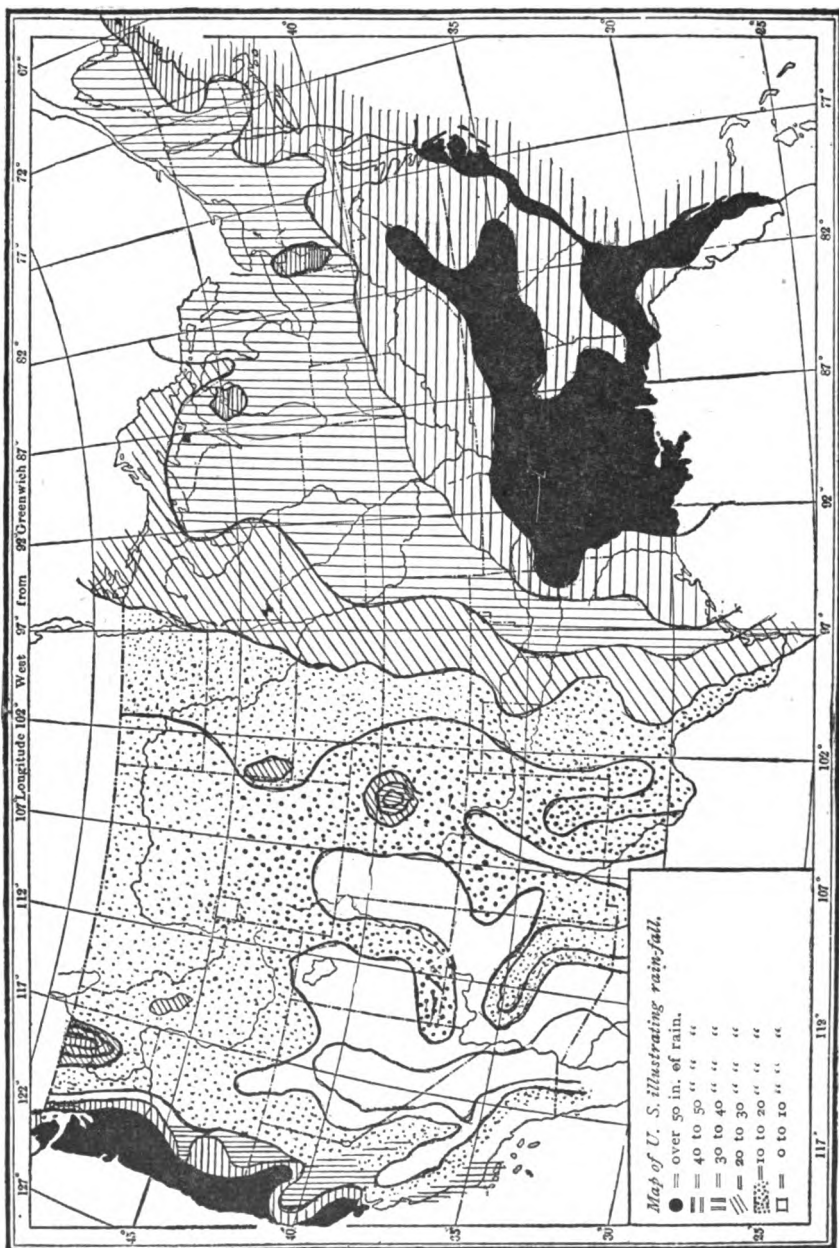
count does not grow well on the low lands of the South, although flourishing throughout the southern upland region. The corn plant is peculiarly sensitive to frosts, and successful corn culture is impossible where exemption from frosts is not assured.

The need of abundant rainfall is shown by the fact that nearly nine-tenths of the crop is grown where the rainfall is between 30 and 50 inches, only one-half of one per cent. being produced where the rainfall is less than 20 inches. Another reason can be given for this. Corn requires hot nights as well as hot days for its best growth. In regions of small rainfall the air is dry during the growing period and the radiation of heat during the night is much greater than where the air is moist. The days in such a region are hotter and the nights cooler than in a moist climate. This condition prevails over all the drier portions of the United States, especially where dryness and elevation go together; and for this reason but little corn is grown where the elevation is more than 2000 feet. It may be added that the liability to damage from frosts is more serious in the highlands.

Abundant rainfall during the growing season is especially essential to a large yield of corn. Practically all of the crop is produced where the rainfall is between 15 and 30 inches.

(100) Varieties of Corn

Within the climatic limits which have been described, corn very readily adapts itself to changing conditions of soil and climate. This power of adaptation is shown by the fact that 150 standard varieties of corn are successfully cultivated in the United States. The two main varieties of corn are known as flint corn and dent corn. The dent corn plant branches higher and bears ears higher on the stalk, the stalk, moreover, being less liable to branch below. It is also distinguished by a depression in the face of the kernel. Flint corn produces its ears near the ground and bears fewer on each stalk. Its kernel is harder than that of dent corn, and has a smooth and shiny surface.



(101) Other Grains

The following tables show the location of oats, rye, barley, hay and potatoes in the United States in 1899. Only the important producing states are included:

I. Oats.

Name of State.	Production, Bushels, 1899.
New York	45,401,608
Pennsylvania	39,148,032
Indiana	34,301,248
Illinois	127,278,948
Wisconsin	67,687,380
Minnesota	52,688,416
Iowa	126,985,749
Missouri	20,299,350
Kansas	39,129,410
Nebraska	51,474,120
Ohio	32,945,976
Michigan	30,599,048
North Dakota	17,987,670
South Dakota	15,332,278
Texas	17,067,975

It will be seen from this table that the production of oats, while largest in the heart of the corn belt, extends much farther north and south than either corn or wheat. Oats is a hardier grain than either corn or wheat, and is therefore less affected by climate. Considerable quantities of oats are raised in nearly every state. The chief use of this grain is for stock feeding purposes. Of recent years, in the form of oat meal, rolled oats and other prepared foods, it has become an important article of American diet. Oat straw is also valuable. It is much superior to wheat straw as cattle feed and is also in large use in manufacturing industry, both for packing and in the manufacture of paper.

II. Rye and Barley.**Rye.**

State.	Amount.	State.	Amount.
New York	2,034,816	Wisconsin	1,475,100
New Jersey	550,432	Minnesota	467,238
Pennsylvania	2,007,406	Iowa	811,944
Illinois	542,533	Kansas	649,258
Michigan	570,446	California	426,722

Barley.			
State.	Amount	State.	Amount.
New York	2,026,236	South Dakota	699,003
Wisconsin	3,068,220	North Dakota ...	1,950,086
Michigan	445,029	Washington	620,558
Minnesota	2,524,679	Oregon	398,958
Iowa	3,723,688	California	11,119,888
Kansas	859,455		

(102) The Production of Rye

The production of rye is of little importance in the United States, and is not increasing. The total yield in 1899 was 23,-961,741 bushels, less than three million bushels increase over the crop of 1879. Although formerly in large use as a bread grain, its chief use to-day is for distilling purposes. Rye is a very hardy plant and thrives best in a cool and moist climate. This is apparent from the location of its production. Rye straw is in demand for making paper and pasteboard.

(103) Cultivation of Barley

Barley is cultivated through a wider range of climate than any other cereal. It is the most hardy member of the cereal group, growing almost up to the point where vegetation is arrested by the cold, and flourishing also in a semi-tropical climate. It will be observed from the table given above that California produces more barley than any other state, while on the other hand, in the eastern part of the country, New York has a large production. Barley is mainly used in the brewing industry.

III. Rice.

(104) The Production of Rice

Rice is a cereal of the grass family, which grows only in warm climates and moist or wet ground. This grain forms a staple article of food in most tropical countries. The rice crop of Bengal in 1898-1899 amounted to 47,863,849,600 pounds. Rice has long been cultivated in the low grounds of the Carolinas where natural conditions allow the flooding of the rice fields; but the crop has always remained small. In spite of the

fact that rice is a palatable and highly nutritious food and that it can be prepared in a variety of ways, it has not, until recently, begun to make its way into the American dietary. Of late years, the prejudice against its use has been overcome and the crop has been rapidly increased, chiefly from the rapid growth of the industry in southern Louisiana where irrigation is extensively practiced. The rice crop of 1898-1899 was 136,990,720 pounds, of which Louisiana produced 107,792,000 pounds. The industry is at present confined to North and South Carolina, Georgia, and Louisiana. Florida may be expected to eventually contribute to the supply.

IV. Potatoes.

The following table presents the potato crop of 1899 by states. Only large producers are included in the list.

State.	Yield in bu.	Acres.
Maine	6,514,235	46,865
New Hampshire	2,370,074	18,662
Vermont	3,288,780	24,915
Massachusetts	3,760,710	28,065
Rhode Island	1,024,104	7,212
Connecticut	3,323,060	25,562
New York	28,707,976	326,227
New Jersey	3,980,265	47,955
Pennsylvania	15,243,815	179,339
Maryland	1,420,352	22,193
Virginia	2,409,990	36,515
North Carolina	928,701	16,293
Texas	927,936	14,499
Arkansas	1,773,198	28,146
Tennessee	1,135,464	25,806
West Virginia	2,672,784	37,122
Kentucky	2,025,210	39,710
Ohio	11,505,053	162,043
Michigan	11,430,210	173,185
Indiana	8,214,232	108,082
Illinois	15,648,192	163,002
Wisconsin	16,102,711	156,337
Minnesota	10,888,608	113,423
Iowa	10,847,800	198,478
Missouri	8,757,496	105,521
Kansas	9,466,370	99,646

Potatoes (continued).

State.	Yield in bu.	Acres.
Nebraska	13,494,640	143,560
South Dakota	4,440,150	56,925
North Dakota	3,074,962	29,854
Colorado	2,713,536	32,304
Washington	2,217,168	15,397
Oregon	1,717,410	14,934
California	3,158,617	26,543

(105) Potato Most Widely Cultivated Food Crop

The potato is the most widely cultivated of all edible roots. It is also more productive than any other plant, illustrated by the fact that it produces 30 fold more to the acre than wheat. The potato consists almost wholly of starch, and, on this account, it cannot be eaten to advantage except with other foods. The potato thrives best in the north in a moist, cool climate. It is found in two varieties, the Irish, or white potato, and the sweet potato, or yam, which is the kind grown in the Southern States, although produced on a large scale in those portions of the north which enjoy a mild climate. The universality of its production is shown by the preceding table, in which almost every state is represented.

(106)

V. Hay. (1899.)

State.	Production (tons).	Acres.
Maine	879,163	976,848
New Hampshire	535,866	602,097
Vermont	961,288	843,235
Massachusetts	667,499	590,707
Rhode Island	64,977	73,008
Connecticut	446,953	475,482
New York	4,530,307	4,356,064
New Jersey	325,519	392,191
Pennsylvania	3,068,970	2,557,475
Delaware	48,620	46,750
Maryland	319,781	282,092
Virginia	588,063	534,603
North Carolina	195,789	130,526
South Carolina	176,112	144,354

V. Hay. (1899—continued.)

State.	Production (tons).	Acres.
Georgia	158,466	109,287
Alabama	82,746	49,847
Mississippi	79,059	54,902
Louisiana	49,540	25,405
Texas	444,953	311,156
Arkansas	205,491	138,845
Tennessee	318,786	243,348
West Virginia	643,707	498,988
Kentucky	394,963	306,173
Ohio	2,133,699	1,641,307
Michigan	1,650,675	1,352,766
Indiana	2,093,376	1,562,221
Illinois	2,365,710	1,833,884
Wisconsin	1,946,718	1,324,298
Minnesota	2,575,230	1,514,841
Iowa	5,025,974	3,750,727
Missouri	3,094,394	2,258,682
Kansas	5,155,908	3,284,018
Nebraska	3,377,698	2,034,758
South Dakota	2,779,474	1,943,688
North Dakota	606,796	384,048
Montana	513,931	361,923
Wyoming	399,783	271,961
Colorado	1,630,274	776,321
New Mexico	65,127	38,310
Arizona	72,651	27,624
Utah	485,852	194,341
Nevada	294,488	157,480
Idaho	539,895	215,958
Washington	613,664	303,794
Oregon	1,255,264	637,190
California	2,784,182	1,708,087

The foregoing table shows how widespread is the cultivation of the various forage crops which can be included under the title of this section. Florida is the only state whose area and production is unappreciable. The yield of hay in the United States includes many kinds of grasses, plants of the clover family, which are not true grasses, and some of the grains. The chief varieties are Timothy, Red Top, Blue Grass, Clover and Alfalfa; the latter, on account of its long root, grows

best in wet ground and, for this reason, even in localities favored with an abundant rainfall, the practice is coming into vogue of irrigating meadows.

THE ANIMAL INDUSTRY

(107) Animal Industry of the United States

The animal industry of the United States is the most important single branch of agriculture because it is the one in which all other branches, in greater or less degree, converge and mingle. Practically the entire crops of corn, oats and hay go into the production of stock. A large part of the cotton crop in the form of cotton hulls and cotton meal; a large part of the rye and barley crop in the form of brewers' and distillers' waste; and a large part of the sugar crop in the form of bagasse, and low grade molasses also contribute to the feeding of stock; while in addition, in many parts of the country, root crops are cultivated for stock feeding purposes. The total number of farm animals in the United States in 1899 was as follows: Horses, 13.6 million; mules, 2.1 million; milch cows, 15.9 million; oxen and other cattle, 27.9 million; sheep, 39.1 million; swine, 38.6 million, a total of 137.2 million. This stock was valued at \$1,997,000,000.

(108) Animals Used for Food

Omitting from consideration for the present everything except the animals used for food, we find that every year in the United States there are killed for food 9,000,000 cattle, 33,000,000 hogs, and 30,000,000 sheep, or a total of 72,000,000 animals each year, valued at one billion dollars on the farm, and at three times that value at the place of consumption.

(109) Territorial Grouping

In regard to the territorial grouping of the animals used for food, it is possible only to give the figures of milch cows, oxen and other cattle and sheep. The statistics of swine are

not sufficiently complete to admit of their classification according to location. Taking these up in their order, we find that the total number of milch cows in the United States in 1899 was 15,990,000, distributed as follows: New England and the Middle States, 3.5 million; Southern States, including Missouri, Kentucky, West Virginia, Texas, and Arkansas, 4.0 million; North Central States, 3.7 million; Prairie States west of Mississippi—Minnesota, Iowa, Nebraska, Kansas, the Dakotas—3.7 million; Mountain States, .3 million; Pacific States, .5 million. Of other cattle, numbering in all 27.9 million, the New England and Middle States had 1.6 million; the Southern States, 9.4 million, not counting Texas, which had 8 million; the North Central States, 3.5 million; the Northwestern States, 6.9 million; the Mountain States, 4.6 million; and the Pacific States, 1.5 million. Of the 39.1 million sheep, 2.1 million were in the New England and Middle States, 6.4 million in the Southern States, 6.1 million in the North Central States, 2.8 million in the Northwestern States, 5.5 million in the Pacific States and 16.5 million in the Mountain States—nearly half the total.

Let us now examine the corresponding figures for 1870 to see what changes have taken place needing explanation. The total number of farm animals in the United States at these two dates was as follows:

	1899.	1870.
Milch Cows	15,990,000	10,023,000
Oxen and other Cattle	27,994,000	16,200,000
Sheep	39,114,000	31,851,000

(110) Increase in the Number of Milch Cows

The number of milch cows has increased approximately 60%; of oxen and other cattle, 75%; and in the number of sheep the increase has been 21%. Referring again to the table of sectional production it may be seen that in 1870 out of 10,000,000 milch cows there were 2.0 million in New England and Middle States, 3.2 million in the Southern States, 2.5 million in the North Central States, .8 million in the Northwestern States and in the other Western States and Territories, 1.2 million. Of oxen and other cattle there were in the New England and Mid-

dle States out of 16,000,000, 2.3 million, in the Southern States, 7.7 million, in the North Central States, 3.6 million, in the Northwestern States, 1.4 million, and in the other Western States and Territories, 1.4 million. Of sheep, numbering 31.8 million in all, there were in the New England and Middle States 5.4 million, in the Southern States 6.5 million, in the North Central States 12.2 million, in the Northwestern States 2.1 million, and in the other Western States and Territories 7.6 million.

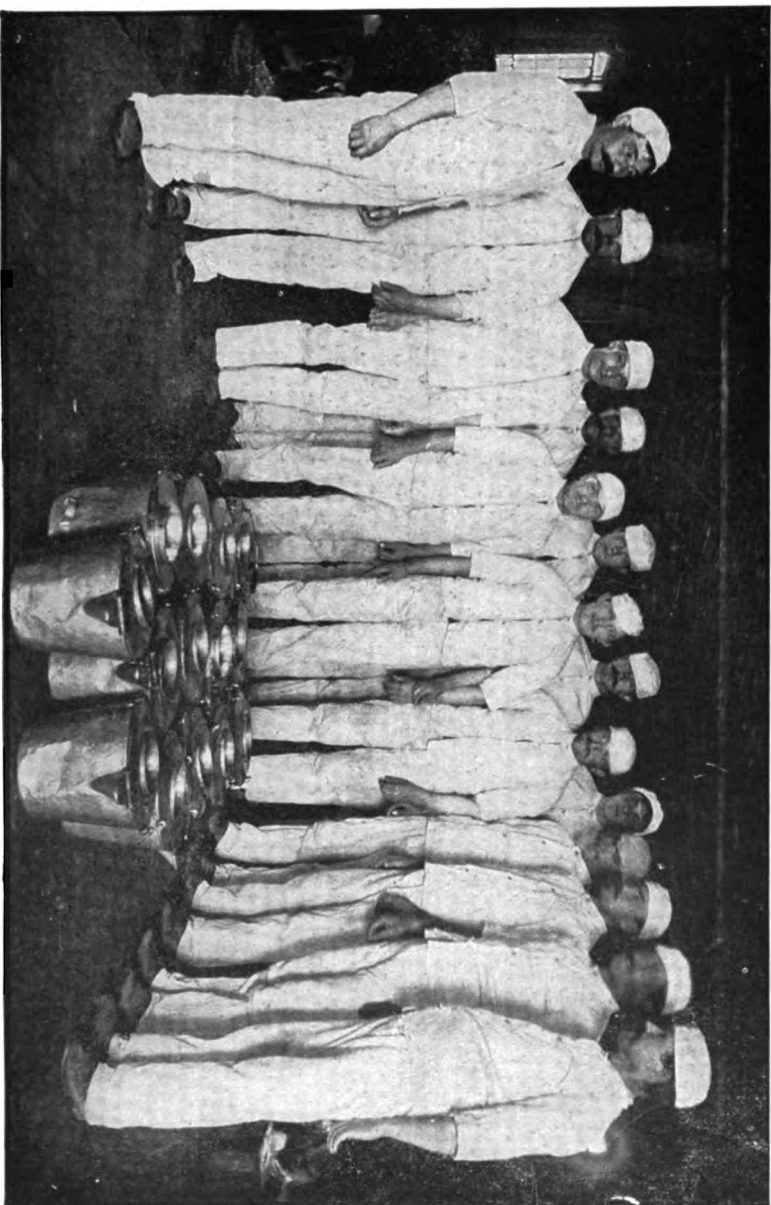
Arranging these results in a table for purposes of convenient comparison we have the following. (Figures given in millions and tenths of millions.)

	Milch Cows		Cattle		Sheep	
	1899	1870	1899	1870	1899	1870
New Eng. & Middle	3.5	2.0	1.6	2.3	2.1	5.4
Southern	4.0	3.2	9.4	7.7	6.4	6.5
North Central	3.7	2.5	3.5	3.6	6.1	12.2
Northwestern	3.7	.8	6.9	1.4	2.8	2.1
Mountain	.3	1.2	4.6	1.4	16.5	5.5
Pacific	.5		1.5		5.5	

In milch cows the New England States have increased their holdings 75%, or 15% more than the average for the entire country. The Southern States have only increased their holdings 25%; the North Central States, 50%; the Northwestern States, approximately, 270%, and the Mountain and Pacific States show a decrease. In cattle, the New England States have fallen off 30%; the Southern States have increased 22%; the North Central States have remained practically stationary; while the Northwestern States have increased their holdings nearly 400%, and the Mountain and Pacific States, 300%. We see, therefore, that in milch cows the New England States and the North Central States have shown a moderate increase. The South has remained practically stationary, while the Northwest has shown a remarkable increase from 2.1 million in 1870 to 3.7 million in 1899.

(III) Oxen and Other Cattle

In oxen and other cattle the New England and Middle States show a marked decline; the Southern States have in-



"MILKERS READY FOR WORK AT LARGE DAIRY FARM IN NEW JERSEY.

By courtesy of H. E. Alvord, chief of dairy division, U. S. Dept. of Agriculture.



creased only 22% as compared with 75% for the entire country; the North Central States have remained stationary, while nearly the entire increase has come in the Northwestern, Mountain and Pacific States.

In order to show this point more clearly let us compare the number of cattle in separate states of the Northwestern, North Central and New England and Middle groups of states for 1870 and 1899.

	1899	1870
New Hampshire	79,000	133,000
New York	561,000	705,000
Pennsylvania	528,000	760,000
Ohio	616,000	800,700
Indiana	641,000	750,000
Wisconsin	589,000	388,000
Iowa	2,163,000	814,000
Nebraska	2,076,000	345,000
Kansas	1,395,000	54,000

(112) Shifting of Cattle Industry

The cattle industry has plainly shifted from the east to the west. It is the same with the sheep industry. The following table gives the number of sheep for the two dates in separate States.

	1899	1870
New Hampshire	78,000	234,000
Vermont	165,000	548,000
Pennsylvania	790,000	1,762,000
Illinois	613,000	1,424,000
Indiana	674,000	2,100,000
Ohio	1,396,000	4,641,000

The Territories.

New Mexico	3,128,000	
Montana	3,377,000	
Wyoming	2,328,000	1,500,000

It is plain from these tables that the industry of sheep raising has also been largely transferred from the Eastern and Middle States to the far West. From all these movements the South has stood almost entirely aloof. Her position is almost the same in regard to the animal industry that it was thirty

years ago. With the exception of Texas and Missouri, the South has stood still and may therefore be disregarded.

(113) Reasons for the Change in Location of Animal Industry

The reasons for these astonishing changes might of course be generally stated to be that the West and Northwest were better adapted to the growing of cattle and sheep than the eastern parts of the country, and that for these reasons the industry had been shifted. Although this may be admitted, still it cannot be denied that there must have been some potent cause at work to have accomplished such great changes in so short a time. This cause was the fall of prices from 1870 to 1896, the main points of which are presented in the following table:

	1870	1896	Per cent. decrease.
Mutton, per lb.	\$.18	\$.12	33 1-3
Beef loins, per lb.	.30	.20	33 1-3
Wool, per lb.	.69	.30	57

This fall was not continuous. There were frequent advances, notably in cattle, during the three years preceding 1885, and, at every advance, the cattle men and sheep men would push out farther west where conditions were more favorable to them, while to the eastern growers, they became all the harder by the succeeding depression. The result of the movement was to exclude from cattle and sheep growing in the Eastern States all except those most favorably situated, while these industries gained a strong footing in the western country. The result of the fall of prices was to hasten the location of the animal industry of the United States in the localities most favorable to its profitable conduct.

(114) Reasons for the Present Location of the Sheep Industry

As was just pointed out, the price of wool had fallen 57% from 1870 to 1896, and the price of mutton, 33 1-3%. By reason of this sharp and sudden decline in the profits of mutton and wool production, the industry had been rapidly shifted to other and more favorably situated localities. We have now to consider the reason for these changes. The following compu-

tations were made in 1888 and refer to the relative cost of raising sheep in the Eastern States and on the plains.

Eastern States. The Cost is per Animal.

Food 4 1-2 months	\$2.02	
Labor, one man, \$17 per month, with board, \$6	.46	
Land (2 sheep to acre at rent of \$1 per acre)	.50	
Interest on cost of buildings and permanent im-		
provements	.05	
Interest on value of sheep, at \$3 per sheep	.18	
	\$3.21	
Return on Sheep		
Wool, 4 1-2 lbs. at \$.25.....	\$1.12	1-2
Mutton, 52.8 lbs. at 5c.	2.64	
	\$3.76	1-2
	3.21	
Net profit per sheep	\$.55	1-2

or at two sheep to the acre, \$1.11 per acre. Sheep growing in the Eastern States, as an extensive employment for the land, is not a profitable business. The Eastern farmer and the farmer of the Central Northern States can make more on almost any other crop than a crop of sheep. Under these circumstances, sheep raising has tended to become a by-industry, sheep being raised in smaller flocks, and only on waste or fallow land. An additional reason for the shift in the sheep and wool industry was the invention of machinery which could comb short staple wool, that is, make worsted yarn out of it.

115) Sheep of Eastern and Central Northern States

The sheep of the Eastern and Central Northern States were almost all descended from the Spanish merinos, valued for their long wool, while their flesh was coarse and of small value for mutton. When long staple wool ceased to bear a high price, these long haired merinos decreased in value, and the low value of their flesh as mutton hastened the abandonment of the industry in this part of the country. On the Western plains, on the other hand, until a comparatively recent period, the land

was almost entirely free. Ownership of a small tract or a water right gave a free range on government lands. There is little or no expense for food. The sheep can get through the winter on the sage brush which the snow does not cover. In Colorado the highest cost for food per sheep in 1888 was three cents per head. Nor is the cost of shelter an appreciable expense. In the North, the sheep are kept near covered sheds in winter, but this practice is not widely extended. The highest cost reported in 1888 was 8 1-2 cents for interest. The only important elements of cost in the western sheep country is for the item of labor, which is about 35 cents per sheep, and for interest on the investment, which is about 9 cents per sheep. The return is much greater than the cost. In Montana, for example, the total cost per sheep is 52 1-2 cents and the return per sheep is \$1.58; while in New Mexico the total cost per sheep is 32 1-2 cents and the return 53 1-2 cents. The net profit from sheep raising in Montana, therefore, is \$1.05 1-2 and in New Mexico 21 cents. This is a larger profit for Montana than that in the New England States and North Central States, and a smaller profit for New Mexico. The general rule, in the western sheep industry in the North, is that the breeds of sheep are better, and that they are tended more carefully.

(116) Superiority of Northern Sheep

The reasons for the superiority of the northern sheep industry are that here the sheep were introduced later and are therefore of better breeds, and also because southern herders are mostly Mexicans, while the northern herdsmen are Americans of much greater intelligence and responsibility. The greater profits to be made on sheep raising in Montana would explain the growth of the industry in that section at the expense of New England and the North Central States; in New Mexico the profits are smaller than in New England. The real reason for the change from East to West, therefore, must be sought in the fact that the land in the West is of no value for anything but sheep raising, while the land in the East is of more value for other purposes. It is not that sheep raising would not be profitable in the East, but that more money can be made at other things, whereas, in the West, sheep and cattle herding

are the only industries which are profitable on the plains, and they will be pushed so long as they are of value.

(117) Future of the Sheep Industry

The final question in relation to the location of our live-stock supply is the probable future of the sheep industry in the United States.

There are three reasons why the West is not the best place for sheep:

1. The mortality from blizzards is very heavy, sometimes amounting to 50 per cent.
2. Food is scanty, and therefore the wool is short, and the sheep are small.
3. Frequent sand storms cut the wool and make the fibre weak.

The Western country is by no means an ideal sheep country, but in the upland region of the South the conditions for sheep and wool growing are almost perfect. Western North Carolina, western Tennessee and eastern Kentucky, with a small portion of Virginia, have a mild and equable climate and a soil which, though not sufficiently fertile to make agriculture especially profitable, is abundantly able to produce good forage. The main obstacle to the introduction of sheep culture is the multitude of dogs which are kept by the negroes and poor whites of that upland region. All that is needed to fit these Southern uplands to be the seat of a large sheep industry is the extermination of the cur dog. This naturally goes with the civilizing of the dog's owner by the rapid industrial development of the South, and the growth of towns and cities to furnish a demand for his labor. The sheep industry, it may thus be seen, is in a transitional state. Started from force of circumstances in the Eastern part of the country, it has been shifted within thirty years to the extreme West, and there lies before it another shift to the upland region of the South.

(118) Shift of the Cattle Industry

The cattle industry has already passed through the transition period, and, with the exception of a larger development in the Eastern States, influenced by conditions of proximity to

market, and a further development in the upper South, will probably remain substantially where it is now found. It will be remembered that I showed the present location of this industry to be principally in the Northwestern prairie states west of the Mississippi, to which should be added Illinois and the Far Western states and territories, especially New Mexico, Wyoming, Colorado, Montana and Texas. It is a mistake, however, to suppose that many cattle are raised in the mountains proper. The seat of the industry is rather on the upland region extending from the 97th meridian west to the Rocky Mountains. Here, again, the shift of the industry is to be found primarily in the vast areas of free land lying open to the cow man. In 1880, for example, in Arizona, the grazing area was estimated at 63,374,000 acres, and of this amount 13,000,000 acres were unoccupied. Similar areas were to be found in Texas, Colorado, Wyoming, Montana and western Kansas. From 1865 to 1885, the stock men took possession of this free land, the principal increase coming from 1880 to 1885, during which period the number of cattle in the Western states and territories increased from 2,281,000 to 5,586,000, being nearly tripled in five years.

(119) Advantages for Growing Stock on Great Plains

The advantages of this great region for growing stock are pre-eminent. This is the region called the Great American Desert. The rainfall is everywhere less than 30 inches, not enough for farming in the true sense, but sufficient for forage crops, of which this region once had abundance. The vegetation of this region, as has been shown in another place, is abundant and well distributed—although nowhere dense and luxuriant—if we except the scanty fringes of cottonwoods and similar trees along the streams. The plants of the Great Plains may be divided into two classes: (1) Grasses and herbs; (2) shrubs.

The grasses proper include a great variety of species, the most common being the buffalo grass, and the bunch grass, so called because it grows in tufts, or bunches. Besides these, there are several varieties of clover, wild rye, and wild oats, and also the alfalfa, which has been largely cultivated in recent years.

These are mainly spring and early summer grasses which gradually dry up, although retaining most of their nutritious qualities, as the summer advances. The winter forage is furnished by shrubs which are called "browse feed." The most important is the white sage bush, which is found all over the region. This furnishes a store of food when the grasses are covered with snow. The entire country is fairly well watered except in seasons of extreme drought, when long drives often have to be made to get the water; and the climate, on the whole, is favorable to cattle, although heavy losses from blizzards are frequently sustained. Altogether, this region may be considered to be as fine for grazing as any in the world, and it was occupied with great rapidity by the cattle men during the early eighties as already indicated. From 1880 to 1885 the value of a beef steer increased from \$17.47 to \$25.54, or nearly 50 per cent.

(120) Manner of Occupying Land and Handling Stock

The manner of occupying the land and handling the stock was very simple. All the land was surveyed and in general belonged to somebody, mainly to railroad companies, or counties; but for many years the owners did not appear to claim their title, so the stockmen had it their own way. The method of occupation was as follows: The prospective stock raiser leased water rights, and selected a suitable range for his cattle, having special regard to the rights of his predecessors. In early days five to ten acres per head was deemed sufficient for each steer. The stockman then selected his brand, hired his cow-boys, bought his cattle and was ready for business. The total investment for a herd of 1000 cattle in 1880 was \$12,350. At the end of five years, providing no serious casualty had overtaken the herd, it would number 4812 head, having increased nearly five fold in the five years. The annual cost of holding a herd of cattle in this way was \$1.00 per head.

(121) Important Changes in Cattle Industry of Plains

In recent years important changes have occurred in the cattle industry of the plains.

1. The land is now leased by the stockmen—the days of free grass are over.

2. Driving to market has almost ceased. This has been brought about by the opposition of settlers, or "westers" as they were called, to the passage of the cattle over their fields, and also by the rapid increase of railway mileage. The stockman can now send his cattle to market by rail and after the short railway journey they arrive in better condition than after the drive.

The second prominent feature of the cattle trade in recent years has been the development of the business of corn fattening for market in the states of the corn belt—Iowa, Nebraska, Kansas, Missouri and Illinois. The farmers of these states either breed their own cattle, fattening and selling them when three years old, or, on the other hand, and this is more common, they purchase grass-fed steers off the western ranges in the autumn, fatten them on corn during the winter, and send them to market in the spring. This development has become especially important since the rich forage of the plains, owing to the overstocking of the ranges, has been so much reduced in quantity that cattle can no longer be so easily fattened for market on the ranges. Range fodder is now barely sufficient to maintain a steer and raise its weight to 900 or 1000 pounds. These lean steers are taken into the corn belt, where a winter's feeding of corn and green fodder in a yard will sometimes add 600 pounds to an animal's weight. This then is the principal change which has taken place in the cattle industry—the cessation of range shipping to the consumption market, and the development of a close relation between the corn states and the grass states; the framework being built up on a grass diet, while the flesh is put on by corn feeding.

(122) Distribution of Horses and Mules

The distribution of horses and mules in the United States is shown by the following table:

States & Territories	Horses	Mules
Maine	109,747	
New Hampshire	55,578	
Vermont	84,388	
Massachusetts	66,017	
Rhode Island	10,384	
Connecticut	44,119	
New York	590,771	3,712

States & Territories	Horses	Mules
New Jersey	79,972	7,196
Pennsylvania	559,722	37,794
Delaware,	31,192	4,879
Maryland,	130,959	12,891
Virginia	236,279	36,358
North Carolina	148,164	112,512
South Carolina	68,319	98,331
Georgia	109,935	157,008
Florida	38,050	8,521
Alabama	133,546	132,321
Mississippi	203,492	164,713
Louisiana	145,029	92,722
Texas	1,125,645	260,562
Arkansas	234,127	142,594
Tennessee	308,073	139,164
West Virginia	150,329	7,264
Kentucky	350,978	96,958
Ohio	640,429	16,883
Michigan	412,462	2,567
Indiana	577,220	38,734
Illinois	983,233	78,936
Wisconsin	418,018	4,611
Minnesota	459,673	8,248
Iowa	979,389	31,232
Missouri	724,597	165,026
Kansas	732,676	82,586
Nebraska	658,807	43,876
South Dakota	287,839	6,626
North Dakota	180,391	6,895
Montana	146,781	878
Wyoming	70,813	1,499
Colorado	145,713	8,580
New Mexico	85,184	3,298
Arizona	52,431	1,031
Utah	71,710	1,615
Nevada	42,090	1,338
Idaho	127,821	889
Washington	171,391	1,470
Oregon	183,986	5,441
California	321,729	48,682
Oklahoma	50,326	9,584

(123) Three General Types of Horses

The three general types of horses are: (1) The horse of the Orient, the Arab, Barb, or Turk, represented in the United

States by the thoroughbred racing stock and by the coach and carriage horse; (2) the heavy draft horse, represented in the United States by the Norman, Clydesdale, Belgian and Percheron—the breed having originated, it is supposed, in Eastern Europe, and (3) the pony, originating in the mountains of Central Asia and not largely represented in the United States. The number of horses in the United States has suffered a marked reduction in recent years. The largest number ever reached was in 1893 when 16,206,802 horses were reported. Since that time the number has steadily declined until in 1900, 13,537,524 were reported. This decrease has been mainly owing to the general introduction of electricity into street railway service, and, to a small extent, to the use of the bicycle. For agricultural purposes, however, the horse is in as much demand as ever, and the recent wars have so increased the demand for all kinds of draft stock that the average price of horses has nearly doubled within three years. There is no reason to fear any present reduction in the number of horses.

(124) The Mule

The mule is a cross between the horse and the ass. It is much more enduring and longer lived than the horse, and has a greater capacity for hard work. The mule was first introduced into the United States from Spain, and this accounts for the large number of mules reported from California. This animal has been employed in the South chiefly because the negro does not understand handling stock and cannot be trusted with horses. The number of mules has not been seriously reduced by the change to electric traction.

(125) Swine Industry

The following table shows the number of swine in the United States on January 1st, 1899, in the states of large production, i. e., containing more than 100,000 swine.

State.	Number.
New York	645,237
New Jersey	151,120
Pennsylvania	1,043,331
Delaware	50,556
Maryland	331,853

State.	Number.
Virginia	917,550
North Carolina	1,369,703
South Carolina	1,041,462
Georgia	2,093,987
Florida	429,128
Alabama	1,866,640
Mississippi	1,957,399
Louisiana	796,498
Texas	2,684,987
Arkansas	1,280,120
Tennessee	1,570,154
West Virginia	331,563
Kentucky	1,357,765
Ohio	3,307,051
Michigan	735,035
Indiana	1,340,231
Illinois	2,008,265
Wisconsin	929,763
Minnesota	411,353
Iowa	3,408,281
Missouri	2,949,818
Kansas	1,591,341
Nebraska	1,353,671
South Dakota	145,469
North Dakota	111,959
Washington	156,748
Oregon	216,430
California	374,141

It will be observed that the hog crop of the United States is concentrated in two districts: (1) The Southern States, and (2) the states of the corn belt. The large number of hogs in the Eastern States is partially explained by their use as garbage disposers near the great cities. The Southern hog is a heritage from slavery, pork and corn meal being the food of the slave. The Southern hog is of no particular breed, and runs wild through the year, picking up his food in the woods. They still furnish the chief food of the Southern people. In the corn belt, on the other hand, hogs are but another form of corn, furnishing a better method of marketing the corn crop. They have been very carefully bred and the stock has steadily improved. The two breeds most widely represented are the Poland-China and the Berkshire. Most of the hogs raised in the corn belt are

sent to market. The principal markets and the number of hogs packed at each market in 1897-8 and 1870-71 are shown by the following table:

City.	1897-98	1870-71
Chicago	2,672,730	918,087
Cincinnati	276,420	500,066
St. Louis	526,440	305,600
Milwaukee	508,074	241,000
Louisville	177,268	242,135
Indianapolis	428,462	105,000
Kansas City	1,305,131	36,200
Omaha	550,175	

(126) Change in Location of Hog Industry

We see here the same change which the cattle industry has experienced—the growth in importance of the Western packing centers as the Western farmers discover the economy of converting the corn into pork and beef and selling it in the nearby market. The number of hogs in the United States is steadily decreasing. In 1892, the year when the largest number was reported, the figure was 52,398,019 and in 1899, 38,651,631. The decrease is in part accounted for by the ravages of hog cholera; in part by the rapid introduction of cotton seed products as substitutes for lard, and in part also to the change in popular taste from pork to beef and mutton.

(127) Poultry Industry

No annual record is kept of the value of the poultry and egg product of the United States. The census of 1890 showed that the product in this industry was as follows:

Chickens	258,871,125
Turkeys	10,754,060
Geese	8,440,175
Ducks	7,544,080
Dozens of Eggs Produced	819,722,916

Poultry farming springs up in the neighborhood of manufacturing populations. At present it is perhaps the most profitable form of agriculture where it is carried on as a regular business. The best breeds of poultry, where the production of eggs

is the object, are the Leghorns, Minorcas, Wyandottes, Plymouth Rocks, Brahmas and Langshans. The best breeds for market are the Plymouth Rocks, Light Brahmas, Cochins, and Langshans. Turkeys, guinea fowls, geese and ducks are also raised, although the two latter are much less popular in this country than in Europe.

THE FISHERIES INDUSTRY

(126) The Value of the Fisheries Industry in the United States

The total value of the product of the fisheries industry in the United States at the date of the last census (1890) was \$43,-128,265, divided among the different sections as follows:

New England States	\$8,133,600
Middle Atlantic States	10,550,640
Southern Atlantic States	11,601,760
Gulf States	2,438,675
Pacific States	6,387,805
Great Lakes	2,615,785
Other inland states	1,400,000

The principal fish and the value of the catch of each kind, with the locality of principal occurrence were as follows in 1899:

Sturgeons—Flesh used for caviare and exported; swimming bladders made into isinglass; heads, skins and refuse. Found in Delaware River and the Great Lakes. Value of catch	\$231,780
Catfish—Caught with other fish on Lakes	61,017
Shad—Atlantic Coast, Mississippi River	505,281
Sea Herring—North Atlantic Coast—Maine to Lab- rador; salted and used to make sardines	279,297
Menhaden or Porgy—Atlantic Coast. Connecticut, Rhode Island, New York. Used mainly in manufacture of oil and fish guano fertilizer ..	2,393,629
Salmon—Northwest Coast; canned	3,737,956
Smelt—Maine rivers	74,977
Whitefish—Great Lakes	691,563
Eels—Atlantic Coast lagoons	223,323
Mackerel—Atlantic Coast; mainly salted	731,424
Bluefish—Atlantic coast, especially New Jersey and New York	664,862
Cod—North Pacific and North Atlantic; especially off the coast of Newfoundland	2,760,000
Halibut—North Atlantic and North Pacific	723,002

In addition to these, which may be considered as true fishes, there should be mentioned the shell fish, which abound along both the Atlantic and Pacific Coasts. The most important of these are oysters, clams, lobsters and crabs. The United States government and most of the states recognize the great importance of the fish industry and guard against the exhaustion of the supply, by placing in different localities millions of young fish, which are hatched at the stations of the various commissions and protected from injury during growth. Many new species of fish also have been introduced by the commissions.

THE DAIRY INDUSTRY

(129) Development of the Dairy Industry in the United States

In the year 1899 the value of the dairy products of the United States was as follows:

Cows.	Products.		Total Value.
11,000,000.	Butter	1,430,000,000 lbs.	\$257,400,000
	Cheese	300,000,000 lbs.	27,000,000
	Milk	2,090,000,000 gal.	167,200,000
			\$451,600,000

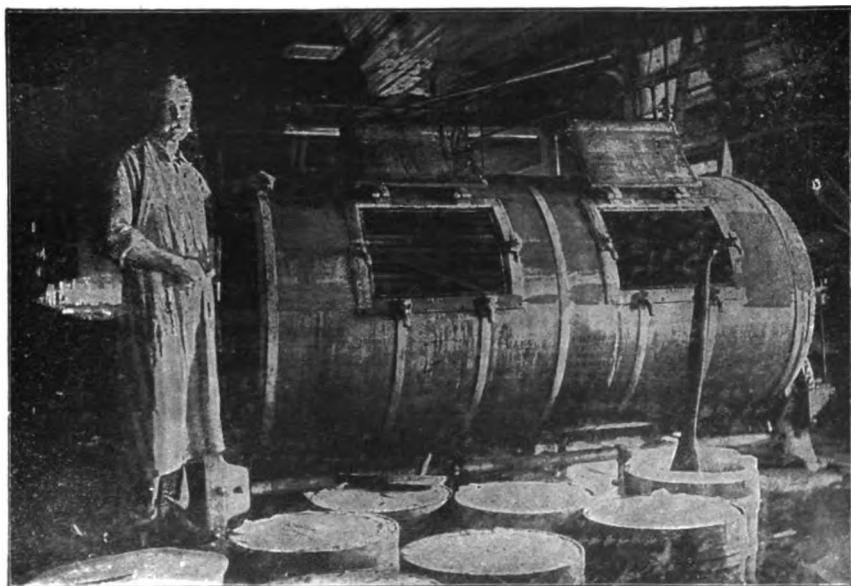
(130) Location of Dairy Industry

Iowa is the most important dairy state. New York is second. Illinois and Pennsylvania are next in rank; and Wisconsin, Ohio, Kansas, Missouri, Minnesota, Nebraska and Indiana form a fourth group. The dairy industry can be carried on successfully in every part of the country. The development of the industry has been greatly facilitated by the central butter and cheese factory, which applies advanced methods to the manufacture of these products; by the steady improvement in the breeds of dairy cattle; and by establishing centers of population which furnish a large market; and the growth of systems of rapid transit, which enable the products of large areas to be collected at these markets. The dairy industry, at the present time, however, produces only one-third of the butter of the United States, and much education of farmers will be necessary before they can be brought to see the advantages of the factory system of butter production.



BUTTER MAKING—THE OLD WAY.

By courtesy of H. E. Alvord, Chief Dairy Division, U. S. Dept. of Agriculture.



BUTTER MAKING—THE NEW WAY.

By courtesy of H. E. Alvord, Chief Dairy Division, U. S. Dept. of Agriculture.



SECTION 3

AMERICAN INDUSTRIES (Continued)

COTTON

(131) Fibres and New Products

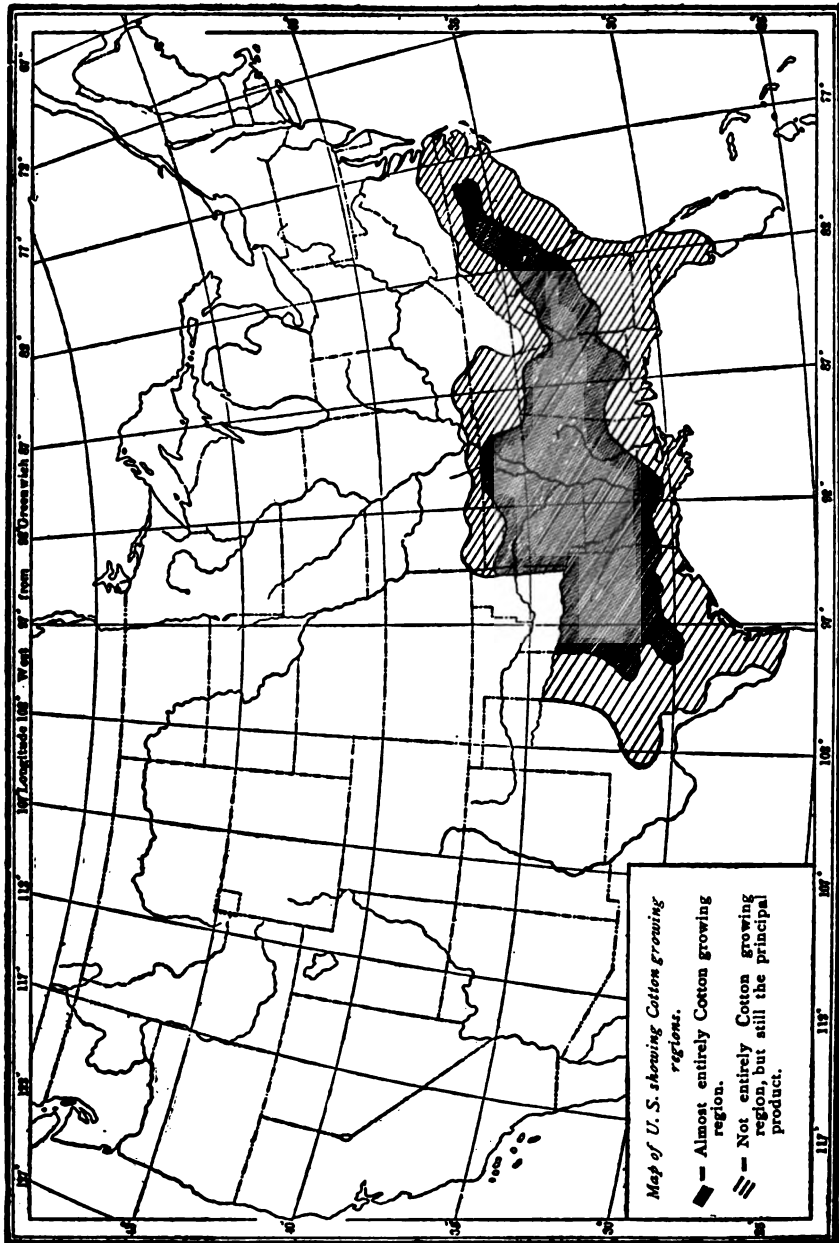
We have now to study, as the most prominent product of Southern agriculture, the culture of cotton. The value of the cotton crop in 1899 was \$334,847,868. Cotton, moreover, is the largest single item in our export trade. In the same year, 1899, out of a total value of domestic exports from the United States of \$1,203,931,222 the single item of raw cotton made up \$241,832,737. This plant has always been the leading crop of the South, and its importance demands careful study.

(132) What Cotton Is

Cotton is a vegetable hair or fibre that grows upon a shrub from 3 to 4 feet high in the upland variety, and 6 to 8 feet high in sea island cotton. The bolls, which contain the seed of the plant, spring directly from the stem, one shrub often containing forty or more. The fibre is produced as a sort of envelope or covering for the seeds, and when the seeds are ripe, the boll splits open, and the fluffy mass of fibre, wrapped more or less tightly about the seeds, protrudes and can be easily pulled out.

(133) Structure of Cotton Fibre

Under a microscope, a cotton fibre appears as an irregular, flattened and somewhat twisted tube. The edges of the fibre are thickened and slightly corrugated. This hollow tubular structure is preserved for about three-fourths of the length of the fibre, when it tapers to a point which is perfectly cylindrical and often solid. The length of the staple of upland cotton ranges from .8 inch to 1.06 inch; that of sea island from 1.41 to 1.81. The diameter decreases as the length increases.



(134) Production of Cotton

Cotton production in the United States is limited to that portion of the country which lies south of latitude 37 north. As a general rule, with the exception of a few specially favored localities, its production does not extend north of North Carolina. As you may see from the map of the cotton belt which appears upon the opposite page, its area is very well defined and strictly circumscribed. The crop produced in 1898 was divided among the different states as follows:

States.	Bales.
Alabama	1,176,000
Arkansas	919,000
Florida	35,000
Georgia	1,378,000
Louisiana	717,000
Mississippi	1,247,000
North Carolina	629,000
South Carolina	1,035,000
Tennessee	322,000
Texas	3,363,000

It may thus be seen that 8-11 or 77% of the crop was produced in the states of Georgia, Alabama, Mississippi, South Carolina and Texas; Texas alone having 30% of the entire crop.

The average yield of lint cotton per acre in each state is as follows, taking an average of seventeen years:

States.	Pounds.
Alabama	146
Arkansas	244
Georgia	155
Louisiana	249
Mississippi	192
North Carolina	178
South Carolina	162
Tennessee	172
Texas	229

(135) Cotton Lands

The best cotton lands are found in Texas, Louisiana, Arkansas and Mississippi, in the flat country, and especially along the rivers in the alluvial lands. The density of production is represented by shading upon the map. Florida is admirably suited for the cultivation of cotton, but the largest part of its area is still undrained. The mountainous region which runs down through eastern Tennessee and western North Carolina into northern Georgia and Alabama, and the sandy plains of southern Georgia and Alabama and northern Florida are not well suited to the culture of cotton.

(136) Temperature Required for Best Development

Cotton is a plant which thrives in a very warm or even a hot atmosphere, providing the atmosphere is moist. For its best development, the temperature should be high and the daily range of temperature uniform during the early growing period of the plant. Any sudden change in temperature during this period will arrest the growth and cause the plant to ripen too soon. The period of growth, from seeding to flowering, ranges from 80 to 110 days, according to variety. During the ripening period, after the plant has stored up all the food material that it needs, the most favorable condition is a decreasing temperature and a greater range of temperature between day and night; for this checks the vegetative growth of the plant and causes it to convert its accumulated food material into fruit, or, rather, cotton. The time required for ripening is from 70 to 80 days. The rainfall, in order to secure the best results, should be heaviest during the season of growth, and should decrease during the season of ripening. It is important also, that the rain should fall at night and that the days should be sunny. Since the growing period is very long, from 5 to 6 1-2 months, a most important consideration is the date of the last killing frost in the spring and the first in the fall. The cotton plant is peculiarly susceptible to frost. All the conditions favorable to cotton growth are well fulfilled in the South.



A COTTON PICKING SCENE.



(157) Temperature of the Cotton States

The mean temperature of the year is about 15 degrees higher in South Carolina, Georgia, Alabama and Mississippi than in Massachusetts, New York and Pennsylvania. During the winter, the mean temperature is about 20 degrees warmer at the South, and during the summer about 10 degrees warmer. The daily range of temperature is about the same in both sections, but is slightly less in the South during the summer, giving more uniform conditions of growth, and is somewhat greater in the South during the months of October and November, the ripening period of the cotton crop. The date of the last killing frost in the northern part of the cotton belt averages about March 25th, and in the southern part about February 15th. The date of the first killing frost for the whole belt, averages about November 15th. This gives ample time for the crop to mature.

(158) Rainfall in the Cotton States

The mean annual rainfall for the Northern States is about 40 inches, and in the South about 56-57 inches. The rainfall in both sections generally increases from the winter, reaches a maximum about the middle of summer, and falls off during the autumn. These are the ideal conditions for the culture of cotton. Although the rainfall is abundant in this section, a great deal falls at night so that the number of clear days is large. In the month of May, for example, in the northern part of the cotton belt, in the years 1889-91, the number of clear days ranged from 13-15, with a rainfall of 2.3 to 4 inches; in the middle belt in '90, rainfall nearly 6 inches, with 12 clear days; in the southern belt in the same year the rainfall was 4.2 inches and number of clear days, twelve.

FLAX AND HEMP**(159) Flax and Hemp**

These are plants yielding tough, strong filaments of fibres. The fibres of flax are much finer than those yielded by the hemp plant and are used to make linen, while the hemp fibres are

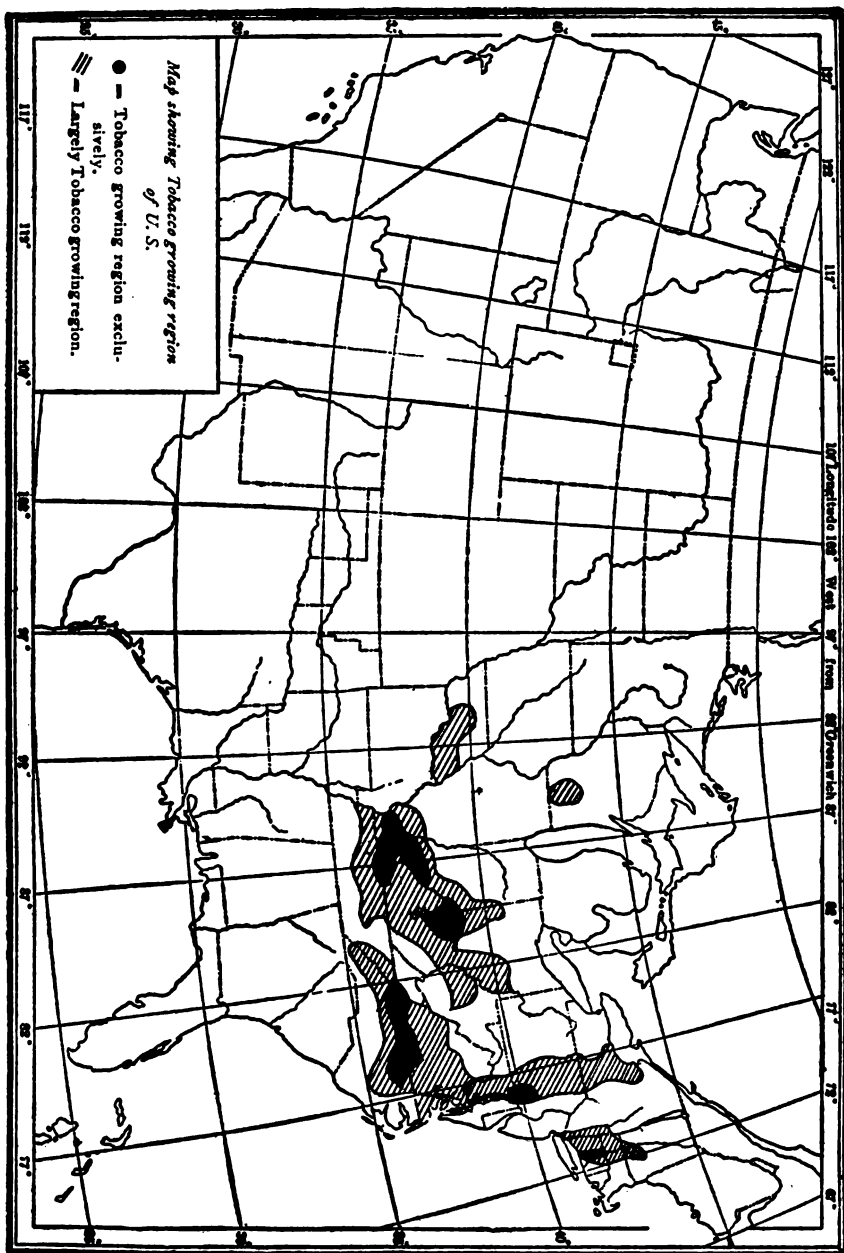
used to make ropes and twine. Flax requires only a short season for its development and grows best in northerly latitudes. In the United States, the principal flax producing states are Minnesota, Iowa, South Dakota, Nebraska, Kansas and Missouri. The preparation of the flax fibre requires a large amount of hand labor and a considerable degree of dexterity. Owing to this fact, the industry has largely remained in Europe on account of the relative cheapness of labor. The hemp plant, although closely allied to flax, seems to thrive best in a hot climate. The domestic supply has never been equal to our home demand. Most of the domestic supply is produced in Kentucky. Various substitutes for hemp have been introduced into the United States, especially into Florida, with some measure of success. Some of these are ramie, sisal grass and pineapple bark.

TOBACCO

(140) Tobacco

Tobacco is one of the most important of American agricultural products. The total yield of the United States in 1896 was valued at \$24,258,070. The United States produces more tobacco than any other country. The following table gives the yield of tobacco by states for 1896:

State.	Pounds.	Acres.
Arkansas	1,327,500	2,950
Connecticut	10,197,450	6,579
Illinois	2,497,280	3,902
Indiana	8,130,760	11,957
Kentucky	143,623,850	196,745
Maryland	9,277,100	15,995
Massachusetts	3,199,500	1,975
Missouri	7,406,000	10,580
New York	3,389,360	3,259
North Carolina	68,629,170	134,567
Ohio	23,688,880	32,012
Pennsylvania	16,244,280	13,884
Tennessee	35,211,660	53,351
Virginia	57,961,260	92,002
West Virginia	3,685,680	5,119
Wisconsin	5,088,000	3,975



(141) Tobacco States

It will be seen from this table, that the list of tobacco states includes widely separated portions of the Union. The Connecticut valley is one of the most important sources of supply, and in the South, North Carolina is a large producer. The climatic range of the tobacco plant is almost as great as that of Indian corn, but the danger from frost is serious. The plant requires a warm, moist, and well-drained soil with an abundance of plant food. Large quantities of the mineral substances which form the food plants are found in the broad leaves of the tobacco plant. For this reason, tobacco culture is perhaps more injurious to the soil, and exhausts its fertility more rapidly than the cultivation of any other plant. It is, therefore, customary to produce tobacco only on "new" ground, immediately after clearing, changing to other crops after one or two crops of tobacco. Unless this method is followed, a large expenditure for mineral fertilizers is necessary. A crop of tobacco requires very careful tending, and is much exposed to damage from insects.

SUGAR**(142) Sugar**

The United States is as yet almost entirely dependent on foreign countries for its sugar. In 1899, the amount of the sugar imported into the United States was 2,219,847 tons, of which 1,950,014 tons were imported and 269,833 tons were locally produced. The imports, therefore, were almost nine times as great as the domestic production.

Sugar is contained in almost all plants at some period of their growth. For example, Indian corn, before the kernels begin to harden, is very rich in sugar. From but few of these plants, however, can sugar be extracted on a commercial scale. The plants from which sugar is derived are the sugar cane, a plant closely allied to Indian corn, and generally resembling it; the sugar beet, whose juices contain a large percentage of sugar; the sugar maple, and the sorghum cane, a northern variety of the sugar cane. Sugar is extracted from these plants

when ripe by crushing out or diffusing out their juice, boiling the juice and allowing the sugar to crystallize and sink to the bottom of the boiling-pan. The method of extraction does not differ essentially in the treatment of any of these four sugar producing plants. In the United States the amount produced from these various sources in 1900 is shown by the following table:

Total Domestic Product to 269,833 tons.

Produced from imported molasses	7,647	tons.
“ “ “ cane	174,450	“
“ “ “ maple	5,000	“
“ “ “ beet	82,736	“

(143) Cane Sugar

Cane sugar on a large scale is exclusively produced in Louisiana. Sugar cane culture demands a warm, moist climate, with a very long growing season. Southern Florida and southeastern Georgia are also believed to satisfy these conditions, but as yet cane culture on a large scale has not succeeded in these localities. The production of beet sugar has been rapidly extending. In 1887, the output of beet sugar was only 255 tons, from which small amount it has increased in fourteen years to 82,376 tons, and is still rapidly extending. It is not unlikely that the United States will in time produce all the sugar used by her people. Sugar beets can be grown in every part of the Northern States and throughout the West. The principal producers are California, Nebraska, Utah and Michigan. Michigan has increased her output from nothing in 1897 to 14,699 tons in 1899. The production of maple sugar is largely confined to Vermont. No sorghum sugar is reported as being produced. Numerous attempts have been made to introduce the sorghum sugar industry, but so far these have been unsuccessful.

FRUITS AND NUTS

(144) Fruits of North America

The fruits of North America may be divided into the fruits of the temperate zone, and those of the sub-tropical zone. The first group includes apples, peaches, cherries, currants,

pears, plums, grapes and several varieties of berries and melons as its representatives; while of the sub-tropical fruits, oranges, lemons, apricots, pomegranates, figs, dates, limes, bananas, pine-apples and olives. A brief description of the locality of the principal fruits is all that can be given.

(145) Apple

The apple is the principal American fruit. It is grown all over North America. The leading districts for apple culture are the Middle and Southern New England States; the middle altitudes of the Alleghenies in Virginia and the Carolinas; Missouri, eastern Kansas, and northwestern Arkansas; Oregon and Washington.

(146) Peach

Peaches require for their best development warm and bright weather. This fruit is peculiarly susceptible to frost and does not grow well in a moist or cool climate. The principal locations of the peach industry in the United States are along the southern shores of the lower lakes, in lower Michigan and along the Atlantic coast south of Long Island Sound. Peaches are also produced in the southern parts of the Ohio and Missouri River regions.

(147) Pear and Plum, etc.

The pear and plum are well distributed over the whole area of temperate North America. The best varieties are produced in the New England States. The principal varieties of berries require a sandy soil and a warm climate. The southern part of the lake region and the seaboard areas of the South Atlantic States afford the most favorable conditions, although all kinds are well distributed. Melons thrive under the same conditions as berries. The best watermelons come from the Southern States. Grape culture in the Eastern States is largely confined to the southern shores of the Lakes, where a sandy soil and a warm climate ensure the best results.

(148) Sub-tropical Fruits

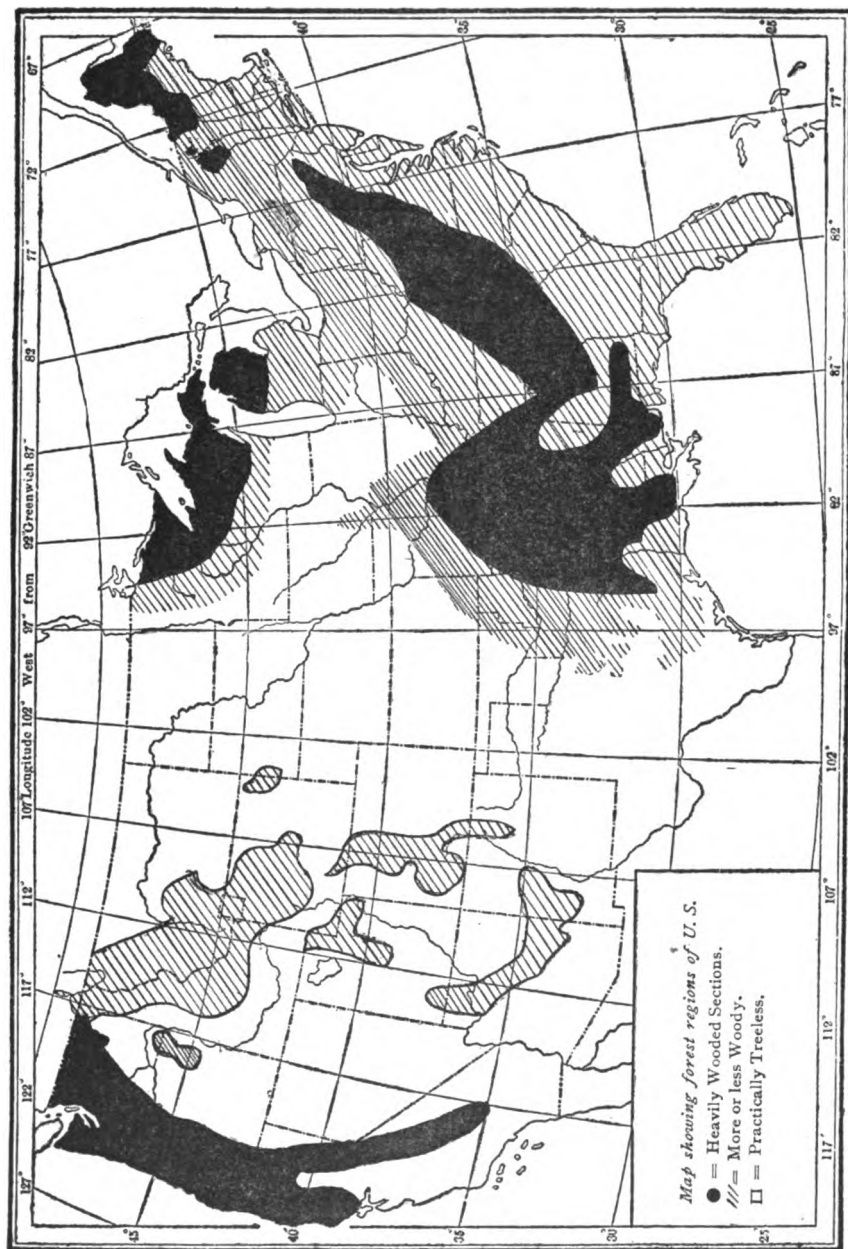
The culture of sub-tropical fruits is carried on in Florida, Louisiana and California. Each of the fruits mentioned above is grown on some scale in some of these states, but only oranges and apricots are produced in large quantities at present. The culture of other sub-tropical fruits is, however, steadily expanding, especially the culture of olives, dates and lemons. There is little doubt that the greater part of our domestic consumption of these fruits will eventually be home grown.

NUTS**(149) Nut Industry in the United States**

The nut industry in the United States has been until recently entirely supported by the native forests. The walnut, filbert, hickory nut and chestnut are sent to market, in large quantities, all over the North. In the South pecans and peanuts are also marketed, the latter being cultivated. In recent years many nut bearing trees have been introduced from foreign countries. Among these are the almond, Brazil nuts, and coconuts. Trees have been introduced into California and are there cultivated, although the product is as yet small.

LUMBER**(150) Timber**

Upon the following page appears the original forest map of the United States. In spite of the fact that for more than one hundred years the work of deforestation has been proceeding, with exception of portions of the prairie region and of the region west of the 100th meridian to the coast ranges, much of this area is well wooded. In 1896, the forest area of the United States was estimated at 500,000,000 acres. The amount of standing timber in the different sections in 1896 was as follows:



Section.	No. Ft. Boards Meas.
South-western States	700,000,000,000
North-western States	500,000,000,000
Pacific States	1,000,000,000,000
Rocky Mountain States	1,000,000,000,000
Total	3,200,000,000,000

(151) Varieties of Timber

The timber of the United States is not only present in great abundance but also in numerous varieties. In the Southern States, are found large forests of yellow pine. In the low grounds of this section, the cypress is found in great abundance. The palmetto, magnolia, tulip and swamp oak are also met with. Farther north, in Arkansas and Missouri, and in the highlands of the middle South, are large forests of hardwood timber—oak, hickory, ash, walnut and cherry. Poplar and sycamore timber are also found in this section. The region bordering on the Ohio River is even more remarkable for its timber. This includes all the principal hardwoods above mentioned. In West Virginia, in 1896, it was estimated that only 25 per cent. of the timber had been cut. By the census of 1890, it was estimated that 2 1-2 billion feet of poplar timber alone was standing in the valley of the Cheat River and its tributaries. In the northern part of the United States there are two belts, the lower of hardwoods, and the upper, including Michigan, Wisconsin and northern New England, of white pine, spruce and hemlock. The western part of this area has been almost entirely cut over, but in northern Maine large quantities of timber are still standing.

The forests of the west coast have been already described. (See page 46.) Although the United States has such a large amount of timber still standing, the supply is rapidly being exhausted. The chief seat of the lumber industry twenty years ago was in the region about the upper lakes. The supply of white pine in this region has now been almost exhausted, and the industry has changed its location to the South. It is now chiefly carried on in the upland region of the South, in the Ohio River region, in northern Maine, where the paper industry

consumes great quantities of spruce and hemlock timber, and on the west coast. More recently, the lumber industry has sprung up in the swamp lands of the Southern States, and in the Coastal Plain. Yellow pine and cypress timber are now important Southern products. The annual cut of timber in this country is estimated at about 40,000,000,000 feet and is steadily increasing every year. It is feared that at the present rate of increase the supply will not last more than a half century. The question of the forest is, therefore, becoming one of serious interest.

(152) Deforestation of the Soil

The deforestation of the soil is a source of great injury to agriculture. A general forest distribution, not so much in absolute area as in the number and location of standing timber, is of the greatest benefit to the farmer. It reduces the soil temperature in the summer, and raises it in the winter. It increases the moisture of the atmosphere from 3 1-2 to 10 per cent. It increases the rainfall. Abundance of trees prevents rapid evaporation of water from the soil, and thus supplies the roots of growing plants with sufficient moisture. According to one observer, the available moisture is increased 46 per cent. by proper forestration. The roots and the leaves of the trees form a thick, spongy covering for the soil, and the leaves break the fall of the rain, so that the water descends gradually, and is absorbed by the soil-covering instead of being allowed to run off quickly, washing the soil of the hillsides down into the streams and so impairing the fertility of the land.

(153) Importance of the Forest, and Danger of its Destruction

The moisture resulting from the melting of snow is retained by forests in the same manner, and the violence of floods is, therefore, lessened. The importance of the forest, and the danger of its destruction has, in recent years, attracted much attention in the United States, and both state and national authorities have taken up the question of forestration. Large forest reserves have been established on the public lands, within which no timber may be cut except by permission. Individual states have pursued the same policy with their public lands; and it has been proposed in some states that large purchases of forest

land should be made, since it is evident that the revenue derived from the judicious cutting of the timber would pay the interest on the purchase price. Some European countries extend their supervision to the lands of private owners, and require that, as trees are felled, others shall be planted. We are still a long way from such a drastic policy in the United States, but it is to be hoped that the rapid increase of knowledge among the farmers upon the subject of forestry, will check the denudation of the land without the necessity of intervention by public authority to stop the destruction of the forests.

INDIA RUBBER

(154) Production and Manufacture of India Rubber

India rubber is the coagulated juice of certain trees and plants. It is abundant in the juice of milkweed. The chief sources of supply are in Brazil, Central America, Mexico, Java, Penang, Singapore, Assam and Natal. The method of production of the crude rubber is as follows: The trees are tapped, and the juice collected in earthen or wicker moulds in which it is afterwards dried over a fire. It is prepared for use in manufactures by mixing with the crude rubber, when in a melted condition, a small amount of sulphur and magnesia or other metals, and exposing the mixture to a high temperature after it has been run or rolled into the form desired.

(155) Imported Materials

1 The United States includes such a vast range of climate and soil, that it is capable, when the resources of the country have been fully developed, of producing nearly every material required by the American people. At present, however, a large number of these materials are obtained, in whole or in part, from foreign countries. The most important of these materials which were imported in 1900, classified according as they belong to the vegetable, animal or mineral kingdoms, together with the values of the several quantities, are presented in the following table:

I. Vegetable Kingdom.

Name.	Value Imported.	Whence Imported.
Breadstuffs ...	\$1,803,729	Dominion of Canada (barley, wheat). Great Britain (oatmeal). France (food preparations).
Barks	563,065	Netherlands, Great Britain.
Dye Woods ...	1,083,644	British West Indies, Hayti (log-wood). France, Great Britain (extracts and decoctions).
Gums	6,884,704	Austria-Hungary, United Kingdom (gum arabic). Great Britain (gum camphor). Mexico (chicle for chewing gum). British and Dutch East Indies (other gums).
Indigo	1,446,490	Germany, United Kingdom.
Licorice Root..	1,667,256	France, Russia, Spain, United Kingdom.
Opium	1,123,756	Turkey, Great Britain.
Vanilla Beans..	1,209,334	Great Britain, France, Mexico, British Australasia.
Cocoa	5,657,283	Portugal, British West Indies, Cuba, Hayti, Brazil, Colombia, Equador, the Guianas, Venezuela.
Coffee	52,467,943	France, Germany, Netherlands, United Kingdom, Central American States, Mexico, West Indies, Brazil, Colombia, Venezuela, Aden, British and Dutch East Indies.
Cork	1,444,825	Spain, Portugal.
Cotton	8,205,397	Germany, Italy, United Kingdom.
Fibres	31,559,311	United Kingdom, Mexico, Philippine Islands, British East Indies.

Name.	Value Imported.	Whence Imported.
Fruits and Nuts	\$7,472,057	Italy, Spain, France, Great Britain, Greece.
Hops		Dominion of Canada, Belgium, Denmark, France, Portugal, Great Britain.
India Rubber ..	31,792,697	Central America, Brazil, Chile, Colombia, British East Indies.
Plants, trees & shrubs	972,385	Belgium, The Netherlands, Gt. Britain, Bermuda, Japan.
Rice	2,279,036	Germany, Great Britain, Chinese Empire, Japan.
Sugar	100,250,974	Austria-Hungary, France, Cuba, Germany, West Indies, Brazil, Guiana, Peru, Hawaii, Philippine Islands, British E. Africa, Dutch East Indies.
Spices	3,401,265	The Netherlands, Great Britain, British East Indies, Dutch East Indies, Hongkong, Japan.
Tea	10,558,110	Great Britain, Dominion of Canada, Aden, Chinese Empire, British East Indies, Japan.
Tobacco	13,297,000	Cuba, Porto Rico, Turkey in Europe.
Vegetables	371,963	Dominion of Canada, Austria-Hungary, France, Germany, Bermuda.
Woods		Nicaragua, Mexico, Cuba, Dominion of Canada.

II. Animal Kingdom.

Name.	Value Imported.	Whence Imported.
Animals	3,727,729	United Kingdom, British North America, France, Netherlands.

Name.	Value Imported.	Whence Imported.
Bristles	\$2,130,537	France, Germany, United Kingdom, Chinese Empire.
Feathers	3,961,660	Austria-Hungary, France, Germany, Great Britain.
Fish	7,472,057	Dominion of Canada, Netherlands, Scandinavia, Great Britain.
Furs and Fur Skins	6,646,807	Chinese Empire, Chile, British Australasia.
Hair	2,445,964	France, Germany, Italy.
Hides & Skins	19,408,217	Austria-Hungary, France, Belgium, Denmark, Netherlands, Russia, Great Britain, Dominion of Canada, Central American States, Mexico, Argentina, Brazil, Colombia, Chinese Empire, French Africa, Aden, Venezuela, British East Indies.
Ivory	1,159,034	Germany, Great Britain, Aden, Africa, Dominion of Canada.
Leather	6,519,172	France, Germany, United Kingdom, British East Indies.
Oils	6,817,780	Scandinavia, Great Britain, Newfoundland and Labrador, France, Germany, Italy, Chinese Empire, British East Indies, British Africa.
Provisions	2,285,383	France, Germany, Italy, The Netherlands, Switzerland.
Shells	1,019,731	Great Britain, France, Mexico, French Oceania.
Silk	45,329,760	France, Italy, Chinese Empire, Japan.
Sponges	536,303	British West Indies, Cuba.
Wools	20,260,000	France, Germany, Great Britain, Russia, Turkey in Europe, Argentina, Chile, Australasia, Cape Colony, Turkey in Asia.

III. Mineral Kingdom.

Name.	Value Imported.	Whence Imported.
Antimony	\$275,774	Great Britain.
Asbestos	293,347	Dominion of Canada.
Asphaltum	469,285	British West Indies, Venezuela.
Bismuth	226,884	United Kingdom.
Phosphates ...	504,492	Germany, Russia.
Potash	3,437,160	Germany, British East Indies.
Soda	5,908,611	Great Britain, Chile (nitrate of soda).
Sulphur	2,711,912	Italy.
Clays	926,111	Germany, Great Britain.
Coal and Coke	4,708,587	United Kingdom, Dominion of Canada, Mexico, British Australasia.
Copper	12,419,901	France, Germany, Great Britain, Mexico, Cuba, British Colombia, British Australasia.
Iron Ore, Pig Iron, Scrap ..	4,169,208	Spain, Newfoundland, Cuba, Scandinavia (pig iron), Dominion of Canada.
Lead	3,142,469	British Colombia, Mexico.
Marble & Stone	1,028,550	Italy.
Nickel Ore & Matte	1,070,980	Dominion of Canada.
Plumbago	2,345,294	Great Britain, British East Indies.
Platinum	1,770,617	France, Germany, Great Britain.
Sulphur Ore ..	1,224,711	Portugal, Spain, Newfoundland and Labrador.
Salt	625,865	Great Britain, British West Indies.
Tin	19,104,301	The Netherlands, Great Britain.
Zinc	152,273	Germany.
Mica	314,882	Great Britain, Dominion of Canada.

(156) Subdivisions

The following shows the different commodities included under the general headings which have been given:

Asbestos—

Animals—cattle, horses, sheep.

Asphaltum—antimony.

Breadstuffs—barley, corn, oats, oatmeal, rye, wheat, wheat flour, sago and tapioca.

Barks—chinchona or others from which quinine can be extracted.

Bismuth—

Bristles—

Copper—

Cotton—

Dyewoods—logwood.

Gums—arabic, camphor, chicle, copal, cowrie, dammar, shellac.

Indigo—

Licorice Root—

Opium—

Potash—chlorate, muriate, nitrate.

Soda—caustic, nitrate, sal soda, soda ash.

Sulphur—

Vanilla Beans—

Clays—blue clay, kaolin.

Coal and Coke—anthracite, bituminous, coke.

Cocoa—leaves and shells.

Copper—ore, pig copper, plates, old copper.

Cotton—raw, waste.

Feathers—

Fibres—flax, hemp, istle, jute, Manila sisal grass.

Fish—lobsters, salmon, shrimps, turtles, anchovies and sardines, cod, haddock, hake, pollack, herring, mackerel.

Fruits and Nuts—bananas, currants, dates, figs, lemons, oranges, plums and prunes, raisins, almonds, cocoanuts.

Furs and Fur Skins—

Hair—

Hay—

Hops—

Hides and Skins—goat skins, fish skins, hides of cattle, gutta percha, India rubber.

Iron—iron ore, pig iron and scrap iron.

Lead—ore, pig lead.

Leather—band or belting and sole, calf skins, upper and dressed leather.

Marble—

Mica—

Nickel Ore and Matte—

Oils—whale and fish, mineral, olive.

Phosphates—

Plumbago—

Platinum—

Provisions—meat products, dairy products, cheese, milk.

Rice—rice flour and broken rice.

Salt—

Shells—Cocoons.

Silk—Raw, or as reeled from cocoon, waste.

Spices—nutmegs, pepper.

Sponges—

Sugar—sugar, molasses.

Tobacco—

Vegetables—beans and dried peas, onions, potatoes, pickles and sauces.

Woods—cabinet woods, lumber.

Wool—hair of the sheep, goat, alpaca, camel and like animals.

Zinc—

(157) Raw Materials Imported of Minor Importance and Principal Countries from which Derived

Agates	Germany.
Alabaster	Italy.
Hemlock Bark	Dominion of Canada.
Beeswax	West Indies.
Broom Corn	Austria-Hungary, Great Britain.
Chalk	Great Britain.
Eggs	Dominion of Canada.
Guano	British West Indies, Peru.
Honey	Mexico, British West Indies.
Ice	Dominion of Canada.

Lime	Dominion of Canada.
Meerschaum	Austria-Hungary.
Chromic Iron Ore	Turkey in Europe.
Emery Ore	Greece, Netherlands.
Palm Leaf	Germany.
Paraffin	Great Britain.
Pearls	France.
Gypsum	France.
Pumice Stone	Italy.
Quicksilver	Chinese Empire.
Rotten Stone & Tripoli	Great Britain.
Sand	Dominion of Canada.
Linseed	Great Britain.
Whalebone	Dominion of Canada.

In studying the foregoing, the student will refer to the questions at the end of the section.

SECTION 4.

AMERICAN INDUSTRIES (Continued)

158. The Location of Manufacturing Industry

In the last section, while discussing the location of some of the important raw materials of the United States, it was often necessary to note the causes which have brought about the present arrangement and location of the raw material industries, or, as they are usually called, the extractive industries. In the present section, we are directly concerned with the causes which determine the location of industry in general, with particular emphasis on the causes influencing the location of manufacturing industry.

(159) Principles that Underlie the Making of Transportation Rates

It is necessary at the outset to speak briefly of a subject which we have had no occasion, until this time, to discuss. I refer to the principles underlying the charges made by the railroads for the transportation of raw materials and manufactured products. All industries are dependent upon transportation

lines, either for their supplies of raw material, or for the sale of their products upon the transportation lines. The rates charged for the transportation of goods, are, therefore, of decisive importance in determining where an industry shall be located. The problem before the railroad manager in fixing rates is by no means simple. He has, first of all, to pay the cost of operation of his road. This is made up of wages, supplies, repairs and renewals. He has also to provide the means to pay interest on the bonds or certificates of indebtedness which the railway corporation has issued from time to time to raise money for construction purposes, and for cars, engines, and terminals, and also to pay the taxes levied by the state. He has finally, if possible, to get enough out of the road to pay a dividend upon the stock.

(160) Sums Which Must be Earned by Transportation of Freight

Let us suppose, that these sums must be earned by the transportation of freight. This freight contains a great variety of articles—coal, wheat, lumber, stone, ores, leather, wool, cotton cloth, machinery, wines, furniture and jewelry, besides a host of other articles. It is by transporting these goods for greater or smaller distances that the railway manager must pay operating expenses, fixed charges, and dividends. What is the general rule which he will follow in charging the shippers of the commodities above mentioned for the transportation of their goods? It will be observed, at once, that, weight for weight, these articles vary greatly in value. A ton of coal is worth at the mine, it may be, \$1.25, while a ton of steel rails may be worth 25 times that amount, and a ton of cloth several hundred times the value of a ton of coal. In view of this fact what shall be the freight charges imposed upon goods of different values? Shall they pay the same, weight for weight, or shall the charge vary with the article carried? Let us look at the matter from the standpoint of the railway manager, which we shall find to be identical with that of the shipper, providing that the railway manager is an intelligent man. The first rule which he lays down for his own guidance is that each ton of freight should at least pay the cost of its carriage. The reason for this is evident. If any item

of freight pays less than its own cost of carriage, the road is, to that extent, being operated at a loss.

(161) Utilize His Track and Rolling Stock to the Fullest Extent.

In the second place, the railway manager desires to utilize his track and rolling stock to the fullest possible extent; to ship as much freight as his engines will pull and his cars carry. The reason for this is plain. We have assumed that the road was built with borrowed money. Every mile of track and every engine and car, therefore, is represented in the annual interest charge, and should, if the money has been wisely invested, contribute to pay that interest. The more they are used, the larger, other things being equal, will be their contribution to pay the interest on their cost, and when that has been paid, the larger will be their contribution to the dividend fund. Moreover, it costs much less to pull each car of a train of forty cars than to pull each unit of a train of five or ten cars. The track will carry the larger number without extra expense, and the engine will pull them with very much less than a proportionate increase in the amount of coal burned, while the train crew is the same. We start then with these two rules: First, that each unit of traffic should pay its own cost; second, that the facilities of the road should always be taxed to their full extent.

(162) Principles to Regulate the Freight Charges of the Road

On the basis of these two rules, the railway manager lays down the following principles to regulate the freight charges of his road:

1. To carry any freight which will pay something more than the cost of haulage.
2. To charge as much above the cost of haulage as the traffic will bear.

This second principle requires some explanation. It does not mean that the railroad company shall charge the shipper as much as he can be forced, at a given time, to pay; for this might have the effect of driving the shipper out of business, and thus deprive the railway company of the source of its revenue. Neither does it mean, when properly understood, that the railway should leave to the shipper only sufficient profit to keep

him at work producing freight for the railroad. This policy would prevent that rapid growth of traffic which the extension of business enterprises would naturally bring, and which it is the interest of the railway manager, so long as any portion of his transportation system is not taxed to its full capacity, to encourage.

The effort of the railway manager in assessing rates upon the shipper according to the rule of charging what the traffic will bear, should be to lay such a rate upon each article as will pay the cost of transporting that article, and as much in addition as the shipper can afford to pay while securing for himself a liberal profit. When this rule of policy has been laid down, the general principle of apportioning tariffs among different classes of freight is evident. The cheaper the freight, the lower must be the tariff levied upon it as compared with goods whose values are greater. Raw materials, under this rule, are charged less per ton than manufactured products, and as manufactured products rise in value, the tariff upon them increases. The reason for this discrimination is the well known fact that the margin of profit on a ton of coal selling for \$2, is necessarily 200 times less than the margin of profit on a ton of cloth which may sell for \$400. If the railway charges \$1.00 for transporting the coal 200 miles, it may reasonably charge \$200 for transporting the cloth for the same distance. As a matter of practice, the difference between the freight charged on a ton of coal and that charged on a ton of cloth is very much less than the difference between the price of coal and cloth. The practical operation of this principle of charging what the traffic will bear appears in the following table:

Chicago and North Western Railway.

Commodity Rates from Chicago, Milwaukee, or Manitowoc. Commodities.

(163) Illustration

In straight car-loads, minimum weight 30,000 lbs., unless otherwise specified. In cents per 100 lbs., unless otherwise specified, to: Northwood, Mason City, and Hampton.

Agricultural Implements	21
Bicycles	63
Binding Twine	19
Paving Brick	10 1-2
Pig Iron	1 1-10
Tinware	63

The student will observe how the rate varies with the price of the article; and how, between articles of the same class, bicycles and agricultural implements, both being properly classed under machinery, the bicycle pays the higher tariff. That a higher rate is charged on expensive than on cheap goods is the most important fact to keep in mind concerning the relation between transportation charges and industrial location.

(164) Influence of Competition Upon Rates

It should also be noted, in this connection, that railway rates may be greatly influenced by competition. Two or more lines connecting the same places or covering the same territory, may reduce rates, just as rival merchants may cut prices, until rates may fall below the cost of carriage. These seasons of firm competition always result in heavy losses to the roads, and railway managers are anxious to avoid them. It is also true that when a town or a single factory has the services of two roads independently owned, rates from that town will be much lower than where only one road is available.

(165) Water Competition

The existence of water competition is equally effective in keeping down railway rates. During the winter season, when the lakes are ice bound, rates between Chicago and eastern cities are generally higher. In former years, railways always charged more per mile on the same class of freight for a long haul than for a short haul, but this has been done away with by act of Congress. It is also an invariable rule that rates on the same class are lowest in the direction in which traffic is the highest. For example, west-bound rates are usually lower than east-bound rates because the quantity of freight brought east is much greater than that carried west, and the roads are glad to fill their empty cars at almost any price; for return freight on

cars that usually go back empty represents so much clear profit. It is also true, although often denied by the railroads, and extremely difficult to prove, that large shippers whose patronage is valuable to a road, frequently receive concessions in rates over small shippers, who are frequently put at a serious disadvantage. These discriminations are forbidden by law, but are nevertheless extensively practiced, although this evil is much less serious than it formerly was. The method of granting these concessions to favored shippers is usually by some rebate or return, often in response to a fictitious claim, made by the shipper, for damages or for previous overcharge. These transactions are generally carried on by subordinates, who are anxious, on the one hand to get business for their road, and on the other, to make as much money as possible for their firm. The principals do not, as a rule, know everything which their subordinates do in such transactions, nor do they often trouble themselves to find out.

(166) Transportation Routes

Only second in interest to the question of freight charges, is the question of transportation routes; the reasons why commodities are sent by one route rather than by another, and the changes which are constantly taking place in the relative importance of different routes. This subject can be best understood from a discussion of the direction of the east bound flour and grain traffic, by far the most important element in the long distance traffic in the United States. Grain may be shipped from the west to the seaboard by several different routes. It may be sent down the lakes from Duluth, Milwaukee or Chicago, to Buffalo; there transferred to the Erie Canal, and either carried via the Hudson River to New York, or transhipped at Albany and forwarded by rail to Boston; or it may be transferred to railway cars at Buffalo and so carried to the North Atlantic seaports. These are the lake and canal, lake and rail, or lake, canal, and rail routes. Again, grain may be shipped on all rail route, either to New York, or Boston, the North Atlantic ports, or to Philadelphia, Baltimore or Newport News—South Atlantic ports, or to New Orleans, Galveston or Port

Arthur—Gulf ports. The causes which influence a choice of these various routes will now be considered.*

(167) Prior to 1850, Land Transportation Little Developed

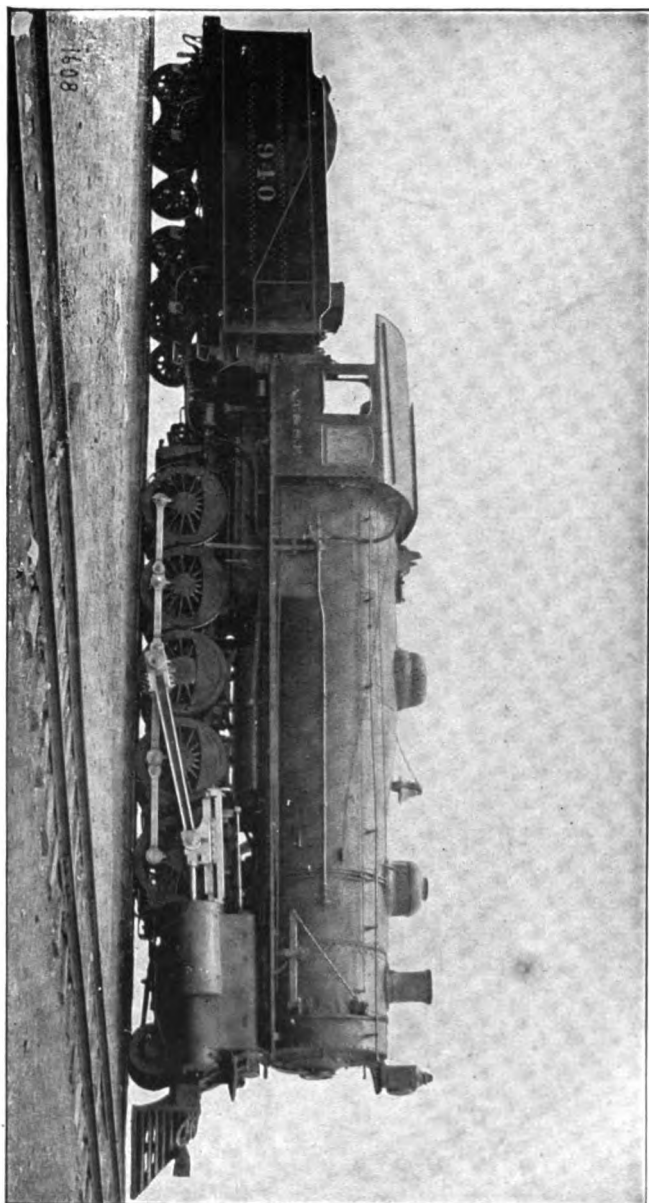
Prior to 1850, grain and other bulky products were shipped mainly along the Great Lakes east and down the Mississippi to the Southern ports. Land transportation was but little developed. The early railroads had been built as adjuncts or feeders to canals. Railroads were few and weak and freights were high. From 1860 to 1880, however, great improvements were made in the railroads, which had the effect of increasing the overland business. These improvements were as follows:

- (a) Reduction of grades and curves.
- (b) Improved ballasting and better bridges.
- (c) Introduction of steel rails, which permitted the use of the heavier engines and larger cars, whose construction the introduction of the use of steel about this time made possible.
- (d) Consolidation of connecting lines and the through freight lines, billing cars from one line to another, which did away with transshipment of freight, which was the dearest charge in the early days.
- (e) Scientific rate making, or charging what the traffic would bear—the fundamental principle of rate making, which has already been discussed and explained.

(168) Result of Improvements in Railroading

As a result of these improvements in railroading, serious competition began between the waterways and the railroads for the flour and grain traffic. The Great Lakes and the Erie Canal had up to this time almost monopolized the eastbound grain traffic, but now the railroads were in position to fight for this trade. In 1872, the railroads first made serious inroads into the lake business, and by 1876 the railroads had gained half of the east bound grain, and they have since waged a vigorous battle with the lake carriers for this traffic. This advantage, which the railroads gained over the lake and canal route, was not so

*Condensation of G. C. Tunell's paper on Diversion of Flour and Grain Traffic from the Great Lakes to the Railroads.—*Journal of Political Economy*, June, 1901.



THE HEAVIEST LOCOMOTIVE IN THE WORLD



much due to the fact that they charged lower rates than boats; in fact, their rates were then and still remain, on the average, considerably higher than the rates charged over the lake and canal route. The success of the railroads was rather due to certain special advantages which they possessed in the forwarding of grain. These advantages were as follows:

1. During four months of the year the lakes were ice-bound and grain could only be sent by rail.
2. The railroads were responsible for the safe delivery of goods entrusted to them and therefore the high insurance paid on all freight carried by lake, averaging \$1 per \$100 of value, was not required.
3. Grain carried in cars during the warm season arrives in better condition than when sent by water.

(169) Railroads Lose in Wheat, but Gain in Corn and Oats

The railroads vigorously pushed these advantages, and provided abundant facilities for handling their new traffic. Beginning with the Baltimore and Ohio in 1872, they built terminal elevators at the Atlantic seaboard. Before these elevators were built, difficulty had been experienced by the railroads in finding storage for their grain; and the provision of terminal facilities greatly increased the ability of the railroads to compete. During later years, however, their share both of the flour and wheat traffic has fallen off. Thus while in the three years, 1876 to 1878, the lakes carried only 695,000 barrels of flour, and 30,624 bushels of wheat as compared with 6,909,000 barrels of flour and 18,343,000 bushels of wheat, during the three years, '94-'96, the lakes carried 3,427,000 barrels of flour as compared with 5,151,000 carried by the railroad, and 41,506,000 bushels of wheat as against 16,948,000 bushels carried by the railroad. It is easy to be seen that the railroads have lost a good share of the advantage they once possessed. The lakes have been regaining their old position as grain carriers.

In corn, the railroads have done much better. In the three years, 1894-1896, the total receipts of corn at Erie and Buffalo, the lower lake ports, were 126,723,000 bushels, and the receipts of corn at the eight Atlantic ports were 107,212,000 greater, in-

dicating that the railroads carried nearly as much as the lakes. The roads have done even better on oats—the receipts of oats at Erie and Buffalo being 78,338,000 bushels, and at the eight Atlantic ports, 168,968,000, or 90,580,000 greater. It is thus seen that the railroads have failed in their competition with the lakes for the flour and wheat traffic, but have succeeded in getting a very large share of the east bound movement of corn and oats. The reasons are as follows:

1. Corn contains a larger percentage of moisture than wheat—especially during the germinating season. It is therefore not advisable to have it gathered in large masses in damp surroundings, as it would be if shipped in the holds of vessels.
2. Oats take up moisture very readily and a small amount of moisture will render them musty, on which account it is desirable to ship them in small lots.
3. Lake rates are fixed on a basis of bulk. Oats weigh only 32 pounds to the bushel vs. 60 for wheat; and lake rates on oats are therefore much higher in proportion to their value than those on wheat. The grain car, however, is so large that it can be loaded to its full capacity with oats; and, therefore, the rates charged by the railroads on this grain are lower than those charged by the lakes.

(170) Movement of Center of Wheat, Corn and Oats Production

Certain other reasons already indicated in another connection, explain the failure of the railroads to compete for the wheat traffic. The center of wheat growing in the United States has been moving north and west, due to the growth of spring wheat culture in Minnesota and the Dakotas. Twenty years ago, the bulk of American wheat was grown in Ohio, Indiana, Michigan and Illinois. This grain would go by rail because a short rail haul to the lakes would be necessary, which would mean high local rates, and these added to the lake rates would more than equal the all-rail charges, especially in view of the fact that the lake and rail distance, Chicago to Buffalo—Buffalo to New

York, was 1299 miles as against 912 miles by all-rail route over the Pennsylvania Railroad, from Chicago to New York. Owing to the fact that the center of wheat production has moved to the north, the situation has been changed. The great wheat district is now located directly west of Lake Superior; and it is therefore shorter to ship by rail to Duluth, and from there to send the grain and flour down the lakes, than to haul the long distance by rail to Chicago and thence to New York. In recent years, the receipts of wheat at Duluth have steadily increased. Most of the flour sent to the seaboard is now made from the hard wheat of the Northwest, and the shipments of flour take the same direction.

(171) Competition of South Atlantic and Gulf Ports with North Atlantic Ports

In corn, the movement of the center of production has been westward, tending rather south than north. Neither corn nor oats is largely cultivated in the Northwest. It is, therefore, natural and easy for corn and oats to be shipped by all-rail route to the seaboard because this is by far their shortest possible journey. Owing, moreover, to the southward trend of corn culture, the South Atlantic ports—Baltimore, Philadelphia, Newport News and Norfolk—have gained the bulk of the all-rail traffic on corn. The South Atlantic ports steadily gained over New York traffic for other reasons. In 1885, New York had 55 1-2 per cent. of the total receipts of wheat, corn, and flour at the Atlantic ports—in 1899, 38.7 per cent. The receipts at Boston during the same period decreased from 15 to 10.8 per cent.; the difference being represented by increased receipts at Philadelphia, Baltimore, Norfolk and Newport News; and the reason being the existence of a differential of 10 per cent. to Philadelphia and 13 per cent. to Baltimore less than to New York. That is to say, the Southern railways are allowed by the Northern lines to charge less than they do themselves. This differential is intended to represent the advantage which New York possesses over the other cities in its larger shipping facilities. Philadelphia and Baltimore began on a large scale in 1891, when 10.6 million bushels of wheat were received.

In 1898 the receipts at New Orleans of both wheat and corn were very large—12.6 million bushels of wheat and 19.7

million bushels of corn. Galveston also received a large share of this south bound traffic—11.2 million bushels of wheat and 5.5 million bushels of corn. This traffic has grown up within a decade. Very little of this south bound grain comes from the territory east of the Mississippi, and none whatever from the region of Northern wheat and the northern part of the corn belt. Here the Southern railroads have no advantage. But south of the southern boundary of Iowa and west of the Mississippi, an area including northern Kansas, southern Nebraska, south-western Iowa and north-western Missouri—a region including some of the best agricultural land in the west, the southern roads have an advantage and have been increasing their share of the traffic. This grain goes, most of it, to Europe and the southern roads claim that this territory should receive its European shipments through the Gulf ports. The great difficulty in building up a south bound grain traffic is found in securing return freights.

We can see illustrated in this competition between the lakes and the railroads, and also between the different railroads, the principles that govern the direction of transportation routes. Cheapness is the dominant factor, but other considerations—of prompt delivery, insurance of the product being delivered in good condition, and adequate terminal facilities—are important factors also.

(172) The Causes which Influence the Location of Industry

Keeping the general principles of rate-making in mind, let us now turn to the discussion of the causes which influence the location of industry.* In the first place, all the operations connected with the extractive industries—mining, agriculture, lumbering—are necessarily carried on where the natural resources are located.

(173) The Operations which Reduce the Bulk and Increase the Value of Raw Materials

Generally speaking, the subsequent operations which reduce the bulk and increase the value of these raw materials are

*Condensation of paper by Professor E. A. Ross, now of the University of Nebraska, on the "Location of Industries," published in the *Quarterly Journal of Economics*, April, 1896.

carried on at the source of supply whenever the increase in weight more than offsets the higher freight charges that result from the increased value given to the raw material by the manufacturing process. The lumber industry is the most common example. Logs are seldom carried far to the saw mill. The gain in value from the log to the plank is not so great as to call for a freight rate much higher than that charged on the log; while the loss in weight, from the first sawing, is so considerable as to make the expense of shipping rough boards much less than the cost of shipping logs. When we come to the subsequent operations of wood working, however, in which the rough boards are planed and grooved and made into furniture and other articles, then we find that, other things being the same, the boards are shipped the long distances and the furniture and woodwork are manufactured as near as possible to the market where they are to be sold. This illustration shows the influence upon the location of industry of the principle regulating freight rates which has just been described, viz., that of charging a higher rate as the goods become more valuable, only here it is the shipper who is concerned to make his freight bill as low as he can by shipping his raw materials at a low rate and selling his finished product, which must pay a high rate, near the factory.

(174) The Influence of Climate upon the Location of Industry

Climate has often a decisive influence upon the location of industry. For example, in all forms of spinning and weaving, the fibres of silk, wool or cotton can be manipulated much more readily and hold together more tenaciously in a moist atmosphere. So important is this influence of climate that in many New England mills, during dry weather, artificial means are used to keep the atmosphere of the mill humid. In the manufacture of cigarettes, on the other hand, a dry climate is considered necessary in order to preserve the flavor of the tobacco which is impaired in damp air. Again, industries that are dependent upon the application of external heat, as, for example, all forms of the iron and steel industry, try to avoid locating in a hot climate. For an example, the iron and steel industry of Alabama is greatly handicapped because it must rely upon

negro labor. The climate is too hot for white men to endure the additional heat of the iron or steel mill.

(175) Perishability of Materials an Important Influence on Location

The perishability of the materials has often an important influence on the location of industry. For example, the juice of the sugar cane, if allowed to stand for a few hours, sours and spoils, and the sugar is lost. For this reason, and also because the canes must be crushed soon after they are cut, the sugar house must be located near the cane field. The canning of salmon must for the same reason be carried on near the source of supply. The manufacture of butter and cheese illustrates the same principle.

(176) Supply of Fuel or Water Power an Important Bearing on Location

The supply of fuel or of water power has an important bearing on the location of industry. Water power is much cheaper than steam power and, for this reason, power industries center about it. The supply of coal, however, is practically unlimited, while the supply of water power is quickly taken up, and coal can be carried long distances at comparatively small cost. For these reasons, when water power has come to be in such great demand as to cause its price to rise, industries tend to leave the waterfalls and move toward the coal mines. Other things being equal, industries will always seek the location of the cheapest power. It is for these reasons that most of the cotton mills built in the United States in recent years have been erected in the South where the numerous rivers of that section fall from the highlands into the Coastal Plain. The development of electric power transmission for long distances has widened the circle of location of industries depending on electric power, and has given promise that, by its further development, water power of mountain and upland regions which is now unavailable because of its location may be some day used. In this connection it should be noted that in the vast majority of cases materials are moved down hill and the lighter products are taken back up the grade. Very few upland regions can be the seats of great industrial centers.

(177) Industries Utilizing the Waste Products

Many industries are calculated to utilize either the waste products or the surplus labor of other industries, and are therefore located close to them. Thus in Armour's packing plant there are 52 separate departments. The hoofs of the animals are made into glue, the largest glue factory in the world being located here. A large soap factory to utilize a portion of the oils and fats; a curled hair factory; a factory for the manufacture of brush handles, knife blades and other bone articles; a factory for the manufacture of articles of horn, such as combs, buttons, etc.; a fertilizer factory which works up bones, offal and blood, and many other departments are included in this one business. An example of an industry so located as to utilize surplus labor is furnished by the presence of the silk industry in the iron towns of eastern Pennsylvania. The women and girls who would otherwise be unemployed find work in the silk mills.

(178) Residence of Consumer Decisive Factor in Location of Industries

The residence of the consumer is the decisive factor in the location of many industries. These are so-called service industries, such as shoe mending, barbering, etc.; and all those industries that produce goods for the personal and individual inspection of the consumer—such as tailoring, millinery, dress-making, photographing, and newspapers. All industries, finally, which can be carried on as well in one place as in another, and in the value of whose products transportation cost does not figure largely, as a rule, seek the consumer.

(179) Specialization of Labor a Determining Factor

Specialization of labor is often a determining factor in locating an industry. A population, such as that of southern New England, for example, may have been trained for generations in particular occupations until it comes to acquire, often it would seem, by inheritance, remarkable dexterity in them. Knife and saw making, all kinds of brass work and other industries requiring a high order of skill, are chiefly carried on in Connecticut, for the reasons that here is the largest supply of highly skilled labor. This factor, however, is decreasing in

importance, with the increasing tendency of the people to move freely about the country, and with the general spread of manual training and technical education.

(180) Cheapness of Labor a Decisive Influence

The cheapness of labor may be a decisive influence in the location of industries. This is most important in those industries which are still in a backward condition, that is to say, in which machinery has not seriously entered, and where, therefore, the cost of labor is of great importance. Such industries are the manufacture of clothing, linen, underwear, gloves, millinery and cigars. The most familiar of these in reference to the importance of cheap labor, is the manufacture of clothing. This is carried on principally in the large cities, where it is given out by contract to men who hire the lowest grade of labor, usually foreigners, who are used to long hours and low wages at home and who work often 16 hours a day for 30 to 50 cents. This is called the "sweating system;" and since it is justly considered to be highly injurious to public welfare, many laws have been directed against it, and some attempts have been made to enforce these laws. These efforts have as yet been only partly successful.

(181) Final Cause Influencing Location of Industry

The final cause influencing the location of industry is the degree of security to life and property that a given locality presents. Neither labor nor capital cares to migrate to places where security cannot be guaranteed by law, and where the sentiment of the community is generally with the law breaker. It is this cause which has for so long hindered the industrial development of the South. The general lawlessness of that section, attested by the numerous lynchings of negroes, is a serious obstacle to its prosperity. Heavy taxation is also a hindrance to large investments of capital.

As a general principle, industry may be said to arrange itself about definite centers where markets are largest and where the raw materials can be most easily assembled. The tendency is to scatter these centers over the country whenever a particular district has grown populous enough to afford a good mar-

ket. The main reason is that which was explained at the beginning of this section—the lower freight charges on the raw material as compared with the finished product, which always makes it an object to a manufacturer to get as close as possible to his market. Only in those cases—to repeat a former statement—where the gain in the smaller weight of the product is more than sufficient to counterbalance the higher cost of transporting manufactured products, does industry in its location cling to the raw material; and these industries are generally those in which the increased value resulting from the manufacturing operation is not great. A further influence working for the diffusion of industry in scattered groups over a wide area, is the general distribution of raw material. In Section II it was shown that most of the raw materials are widely distributed throughout the United States. Timber, iron, coal, copper, lead, clay, petroleum, stone, etc., are found in many places. Even those materials which are grown in one portion of the country are generally equi-distant from many other portions, in some of which manufacturing cities are found, and some not. Take cotton for example. The cotton fields of Arkansas are nearer to Kansas City than the cotton of North Carolina is to Fall River, Massachusetts; and yet, even to-day, cotton goods are carried from Fall River and sold in Kansas City. This condition can only be temporary, and in the same way that we have seen the shoe industry grow up in the middle west, so, in the progress of our industrial development, will all the important branches of manufacture tend to follow the currents of population, finally locating where the markets are largest.

(182) Example of an Industrial Location

A striking example of an industrial location, which will serve to conclude this section, is furnished by Pittsburg. This city is the center and chief seat of the iron and steel trade of the United States. Nearly half the steel produced in this country is made in Pittsburg. In and around the city are more than 4000 establishments engaged in the manufacture of iron and steel, and yet Pittsburg has no workable iron beds nearer than 1000 miles. Turn back to the map of the iron regions of

the United States, and note the position of Pittsburg in relation to the iron mines of Lake Superior. It is from these mines, owing to the purity and abundance of the ore which they produce, that substantially all the iron ore used in the Pittsburg and adjoining districts is taken. It would seem, on the face of things, that Pittsburg is not a desirable location for an industry whose source of supply is so far distant.

Let us, however, consider the other elements in the problem. Pittsburg lies almost equi-distant from the great markets of the East and West. From this point, under present conditions, the majority of iron and steel consumers in the United States can be most easily reached. This cannot be said of a location at the head of Lake Superior and, according to the rule of freight charges, which we have so often applied, the transportation of the raw material is usually preferred to that of the finished product. But there are other reasons for the pre-eminence of Pittsburg as an iron and steel center. The iron industry requires large supplies of coal and gas. Pittsburg is built upon a coal bed, while nearby are the natural gas fields of western Pennsylvania. Furthermore, and most important of all, just south of Pittsburg lies the famous Connellsville coke region, where, from a basin 30 miles long by 3 wide, the coal is mined, out of which nearly all the coke used in iron smelting in the United States is made.

(183) Coke

It may be well at this point to explain that coke consists of the fixed carbon of the coal with some of the carbon contained in the volatile matter. It is manufactured by burning a caking coal in a closed receptacle until nearly all the gas has passed off, leaving the carbon in large sponge-like pieces made up of myriads of little carbon cells, and greatly increased in bulk. This coke makes the best fuel for iron smelting for reasons which will now be given. Iron ore, as we saw, is composed of rock material and pure iron in combination with oxygen. In iron smelting the object is to free the iron from the oxygen and the impurities associated with it. This is done by mixing with the iron ore, in a blast furnace, some kind of fuel

and a quantity of limestone in alternate layers, setting the mass on fire, and forcing a blast of air through it to hasten combustion. The oxygen is released during the process of burning, and unites with the carbon in the fuel, while the limestone melts and unites with the rock material in the iron ore forming what is known as slag. The iron is thus set free and becomes liquid, gradually sinking to the bottom of the furnace; while the slag, being lighter than the molten iron, floats on top of the iron. At the bottom of the furnace, at periodical intervals, the slag and the iron can thus be drawn off separately and the iron can be run into sand moulds and allowed to cool, when it is available for use.

(184) Coke as Compared with Soft Coal

Now coke as compared with soft coal makes the best fuel for this purpose of iron smelting for three reasons: (1) It does not run together and make a cake as does soft coal, so that it offers no obstacle to the passage of the air blast up through the furnace; (2) it retains its shape in the furnace and holds up the great weight which rests upon it, thus making combustion more perfect; (3) owing to its cellular structure it offers a greater burning surface and so produces a greater heat than soft coal. Hard coal, although formerly much used, is now so expensive as to be out of reach. Connellsville coke is by far the best and purest coke made, and Pittsburg is nearer than any other iron center to the Connellsville field. Pittsburg then, at the present time, is the place at which, all things considered, the materials of iron and steel manufacture can be most cheaply assembled, and the products most widely and cheaply distributed. Chicago, Cleveland and Buffalo are also important iron centers, but either because of distance from large markets or long rail transportation of material, they have not attained the position that Pittsburg enjoys.

SECTION 5.

THE ORGANIZATION AND MANAGEMENT OF INDUSTRY.

(185) Business Geography

In the study of Business Geography we are, as the title indicates, primarily interested in the physical features of a country, its soil, climate, rivers, plains, harbors and mountains. In the second place, and following the study of these basis facts, we discuss the manner of formation and growth, and the location of the principal raw materials that are derived from these natural resources. Third, we study the principles which determine the location of the industries depending on the raw materials produced from these resources. At this point the presentation of the subject of Business Geography is, properly speaking, concluded. It is a matter of great interest, however, to understand something of the methods of organizing the collection of these raw materials at the centers of production, the organization and management of the manufacturing plants converting them into finished products, and the distribution of the products to the consumer. The field of this study is so immense, including as it does the whole of the economic process, that only an outline can be given in this place.

(186) Raw Material Collected at Wholesale Markets before Manufactured

After the iron, coal, wheat and tobacco have been produced, they must, in most cases, before being manufactured, be collected at the wholesale markets. Sometimes, however, as business increases in size and extent of operations, the company operating a mill or factory may own its own supplies of raw material; in this case, shipment is made direct from the source of supply to the mill, without the intervention of middle-men or the previous collection of the material at central markets for distribution. The best example of an industry which has the ownership of the sources of raw materials is furnished by the

Carnegie Company. This company owns its iron mines, limestone quarries, coal fields, natural gas fields and coke ovens; so that it has to purchase no one of its materials in the open market and the only transactions involved are questions of book-keeping between departments.

The Carnegie Company, now a part of the so-called Steel Trust, has gone further than the ownership of its raw materials, and owns the boats and railroads by which these materials are transported. It is not difficult to see the advantage of these possessions to the Carnegie Company. Suppose that they were obliged to buy in the open market the materials which they produce. Two unfavorable consequences would result. In the first place, the price paid must be higher than the cost of production, because another company must have a profit; while, under the present arrangement, the price is much lower, corresponding to the cost of production. Moreover, when supplies must be bought in the open market, there are all the disadvantages of irregular and fluctuating prices to contend with; while when the sources of raw material are controlled, both price and supply are far more stable. For this reason, wherever it is possible, the policy of large companies is to control their own supply of raw materials. Some of the railroads now own their own coal mines, and the larger paper companies own spruce and pine forests. In most cases, however, it is impossible to control the raw materials because their production is not concentrated as in mining industry, but is spread over a wide area of territory, and distributed among a multitude of producers. It would be impossible, for example, for the millers to own their own wheat lands, or for the cotton manufacturing companies to own their own cotton fields. The field of production of most of the raw materials is too vast for individual control of necessary supplies.

(187) Collection of Raw Materials

It is important, therefore, that these products should be purchased from the producer, gathered at the centers of industry, and then sent out to the manufacturer, who is, it may be, located in the same city. Furthermore, even in those com-

modities, such as ore and coal, in which control by large companies is possible, it is uneconomical for the numerous smaller companies, which also contribute very largely to the product, to own their supplies of raw material. A company that uses a million tons of ore can own and work an iron mine to advantage, but not so with an iron manufacturing company using only 50,000 tons of ore. Again, in coal, a company which uses 200,000 tons can work a coal mine, but for a cotton manufacturing company using only 10,000 tons a year, there is no advantage in owning its source of supply.

(188) Method of Collection of Raw Material

All the important raw materials of industry then must be gathered at the centers of production before they are distributed to those who work them up into the finished product. The methods of collection may best be understood by a concrete example. Let us consider the method of collecting grain at the central market. This shipping of grain takes place as soon as possible after harvest. The reason is, that the grain, especially wheat and oats, when it is threshed out, contains a considerable amount of moisture, which adds sometimes as much as 10 per cent. to its weight and therefore to the price which will be paid for it; while if kept for a considerable time most of this moisture is lost. On this account, even when the grower is not pressed for ready money, which is often the case, he is anxious to sell his wheat as soon as possible in order to get the advantage of extra weight.

(189) The Method of Grain Collection

Throughout the grain-growing region, at every town of any importance, is to be found an elevator for the reception and storage of the grain that is brought in by the farmers from the surrounding country. (The elevators will be described later on.) These local elevators are sometimes owned by the railroad companies; sometimes by the large elevator companies at the central market; and sometimes by local individuals. The price paid for his grain, to the farmer, is fixed by the price prevailing in the central market, on the day of sale, less the cost of

transportation, a small charge for handling and storing and, sometimes, when it is necessary to borrow money, less interest which is never serious and which varies from one place to another. This price is paid the farmer in cash. The local firm, either through their principals in the central market, or through agents, sell the grain in the central market; or they borrow on its security at their bank. The grain is then shipped to a central market. No attempt is made to keep the lots of grain separate after they leave the growers' hands. All grain is shipped in bulk. Of these central markets, Chicago is, taking an average of all kinds of grain handled, the most important. Other grain centers are Duluth, Minneapolis, St. Louis, Kansas City, Peoria, Detroit and Toledo. Of these centers of grain collection, Chicago is slowly losing its importance. The reasons were shown in the treatment of transportation routes, to be the shift of the wheat industry to the north and the shipment of corn to the Gulf and Southern Atlantic ports. Minneapolis and Duluth are steadily increasing in their receipts of wheat. These cities lie too far north of the corn and oats belt to get much of those grains. Peoria is increasing its importance as a corn center because of the location of the brewing industry at that point; the other cities mentioned are losing ground.

(190) The Classification of Wheat at Wheat Centers

All grain arriving at the centers is graded by inspectors acting under the authority of the state, to ascertain the quality of each car of grain, and to assign it to a definite grade according to which it must be sold. The inspectors are required in Illinois to keep a record of each car, and, if a consignee is dissatisfied with the grading of the inspector, he is allowed a new inspector; after which, if still dissatisfied, he can refer the matter for final decision to a board of appeal appointed by the state. The grades of spring wheat and the description of each grade are as follows:

- No. 1. Northern Spring Wheat, must be northern grown spring wheat, sound and reasonably clean, and of good milling quality and must

contain not less than 50 per cent. of the hard varieties of spring wheat.

- No. 2. Northern Spring—like No. 1, but falling below its standard of cleanness and soundness. It must also contain 50 per cent. of hard wheat.
- No. 1. Spring Wheat—Must be sound, plump and well cleaned.
- No. 2. Spring Wheat—Must be sound, reasonably clean and of good milling quality.
- No. 3. Spring Wheat—Includes all inferior, dirty spring wheat weighing not less than 53 pounds to the bushel.
- No. 4. Spring Wheat—Includes all spring wheat which is damp, musty, sprouted, badly bleached, or for any cause unfit to be classed as No. 3.

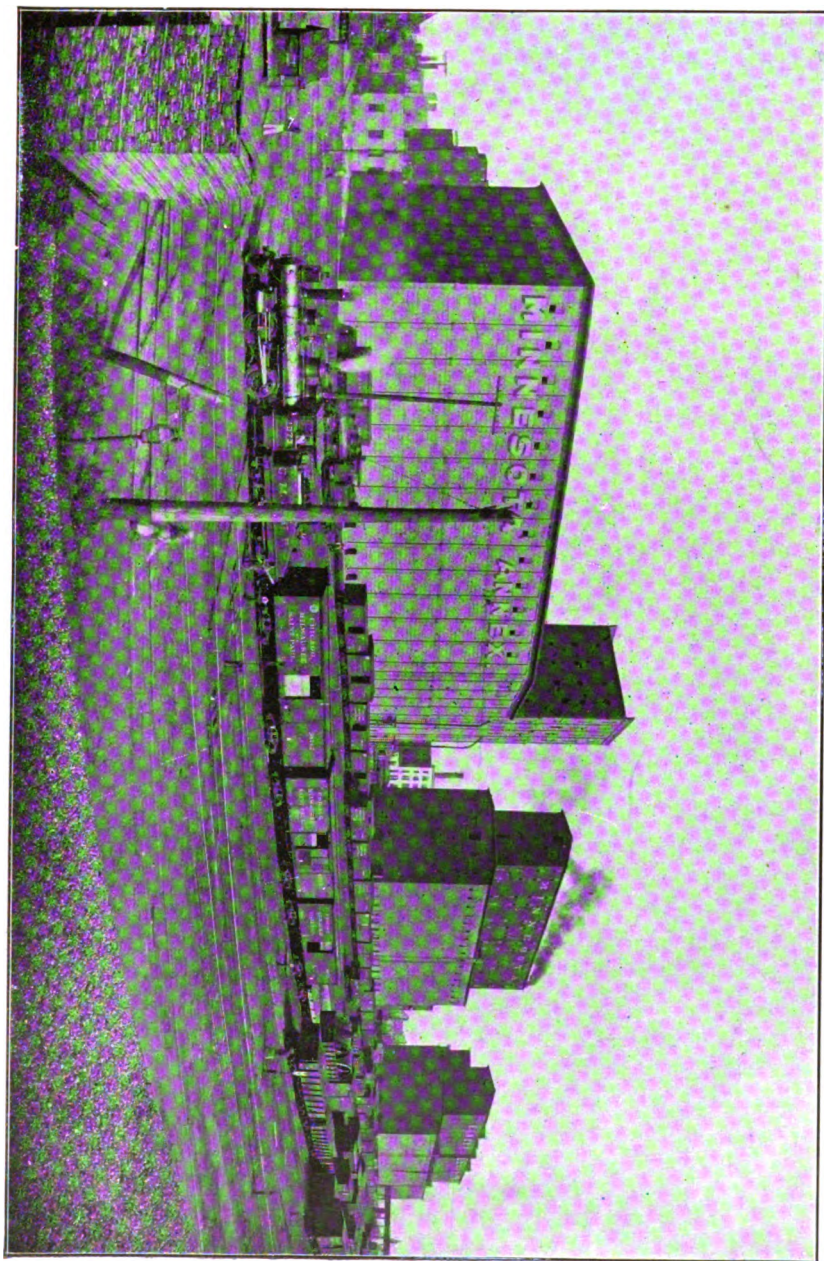
(191) The Advantages of the System

The foregoing is sufficient to show the general principles of classification employed. The advantage of this system of inspection and grading is that the purchaser of wheat, as a result, does not have to concern himself with the quality of the wheat he buys. He purchases wheat of a certain grade and knows exactly what he is buying, although he may never see the grain.

In the Chicago market the grain was formerly sold to commission men, that is, agents who handled it on a commission; but of recent years, the elevator companies buy the grain for their elevators from the local elevators and sometimes from the growers, as owners of the local elevators. On arriving at the center, no matter by whom purchased, the grain is transferred to one of the large elevators of which a description is as follows:

(192) The Grain Elevators

The usual idea of a grain elevator is a huge bin filled to the brim with grain. This is not exactly correct. The ground



GRAIN ELEVATOR



work is built on piles sunk deep into the ground. Stone piers are built on these and the elevator proper is built on the piers. The entire structure, with the exception of the fire wall, separate from the framework, is built of wood.

On the ground floor are long tunnels into which the cars can run for loading or unloading. Above this, rise tiers of lofts, each capable of containing 6000 bushels of grain. In the Indiana elevator in Chicago, there are 248 of these lofts, or bins, besides 52 smaller receptacles. The entire capacity of this elevator is 1,500,000 bushels. Taking Armour Elevator D, as another example, with a capacity of 2,500,000 bushels, we find that it can receive and weigh 300,000 bushels per day, 75 men being all that are required to operate this large elevator. The machinery of the elevator is driven by a compound engine of 1200 horse power. The grain cars are unloaded by means of large scoop shovels operated by steam power. The main driving belt is 250 ft. long by 5 ft. wide and rises from the bottom to the top of the building, where the main counter shaft is located. Along this counter shaft are pulleys carrying 8-inch rubber belts bearing steel buckets, which carry the grain to the top of the structure, to the weighing bins, and descend empty on the other side. The grain boats are unloaded by elevators which can be let down into the hold. The grain when discharged falls through chutes, or covered wooden troughs, to the main body of the elevator, whence it is directed by other chutes to any desired point. This is accomplished by means of a chute rotating on a vertical axis, the prolongation of which would pass through the lower mouth. Thus when swinging around on a pivot, its receiving mouth remains stationary. Around the covered end are ranged the mouths of other chutes, each numbered to correspond with a particular bin. In this way one elevator is made to feed a number of bins. Below the chutes come the garners, and below these the scale bins, each having a capacity of 1000 bushels. All garners and bins are made with sloping sides to allow all of the grain to escape. The grain is weighed twice; once on its receipt and once on its discharge, each weighing necessitating an elevation to the top of the building. The identity of particular lots of grain can easily be preserved. Boats are unloaded by elevators

which can be swung out from the main structure into the hold. The loading is done by means of spouts as already described. In 1898 Chicago had eleven "regular" warehouses with a total capacity of 28,000,000 bushels, four of which were owned by railway companies.

(193) The Brokerage and Storage Charges

The charges for storage are as follows: 3-4 cent per bushel for the first ten days and 1-3 cent per bushel for each succeeding day. The buyer who stores grain in an elevator receives a certificate calling for a certain amount of a certain grain. This certificate represents wheat and is dealt in as such. The charges for selling grain are as follows:

Rye, wheat and barley on consignment in

car load lots 1 cent per bushel.

Corn 1-2 cent per bushel.

The brokerage charges for buying and selling all kinds of grain are \$1.25 1-2 per thousand bushels. The existence of large supplies of a product which is either on hand or expected shortly to arrive, which is wanted at different times in the future, and which is constantly offered for sale, has built up a great business of buying and selling grain, or, as it is called, grain speculation. This is conducted in many large cities, but principally in Chicago. Those who are engaged in it form a regular association, called a Board of Trade or Produce Exchange, with definite rules of procedure, according to which all transactions must be conducted. The elevator companies of Chicago have numerous representatives on the Board of Trade; and, in addition to these, a large number of other firms carry on the business of buying and selling grain and other produce. These dealers and the outside public who deal through them as agents, are divided into two parties—those who believe that the price of grain will rise and those who expect it to fall. The first class are called "bulls" and the second, "bears." The bulls are always buyers of grain and the bears are sellers. A man is a "bull" or a "bear" on the market according to the state of his conditions at a particular moment, and may change sides several times during a day.

(194) "Futures"

A "future" in grain is the right to receive or the obligation to deliver a certain quantity of grain, usually counted in lots of 1000 bushels each, at some date agreed upon in the contract. The man who believes that grain will rise, buys grain to receive it, say in 30 days; and the man who believes that the price of grain will fall, sells grain agreeing to deliver it on a future date. If the price of grain rises, all those who have purchased at a lower price make the difference between the price on the day of purchase and the price on the day of settlement; while, if the price of wheat falls, say from 90 cents to 80 cents, those who have agreed to deliver, say 1000 bushels at 90 cents per bushel, are able to buy in the grain for delivery at 10 cents less than the price they receive for it, and make the difference.

(195) Advantage of Buying and Selling Futures

This practice of buying and selling futures in produce and merchandise of different kinds is of great advantage to both producer and consumer, because it results in the establishment of a daily price which represents the opinions of those best qualified to judge, of what should be, in the existing state of the market, account being taken of all influences affecting either supply or demand—such as size of crops in different parts of the world, famines, wars, high rates of interest, etc.—any cause influencing either the amount of grain for sale or the need of it and the amount of money available to satisfy that need. All these influences are taken into account by the produce exchanges and reflected in the price of wheat. Both producer and consumer, therefore, can know exactly what the value of wheat is and also what it is likely to be in the future, and can make their plans accordingly. Moreover, the operations of the produce exchanges prevent the fluctuations in prices from being as violent as they would be in the absence of such a regulating influence. Without the produce exchanges and the operations of speculation, when the supply of wheat was excessive, the price would fall far below the cost of production; wheat would be a drug on the market, and the excess supply would be used up for stock feeding, distilling, or starch making, which the low

price of wheat would permit. The farmers, having suffered a heavy loss on wheat, would largely abandon wheat raising and turn to other crops. Next year, as a result of a decreased acreage or unfavorable season, the wheat yield might be as much below the average as the yield of the previous year was above it. The large crop of the previous year has been used up or wasted. No supply remains on hand. The demand for wheat is as great as ever, and there is only a small supply to meet the demand. From a low figure, the price of wheat would then rise to an exorbitant rate, injuring the consumer by a high price of bread, and disarranging all business depending on the wheat fields for its supply. These wide fluctuations are prevented by the presence of a large body of men who are always looking to the future for their profits, and who make their plans accordingly.

If the supply of wheat is in excess this year, they know that next year there may be a deficiency with higher prices; and so they buy wheat freely and keep the price from falling so much as it would fall in the absence of the restraining influence of increased demand; also insuring a reserve supply of wheat when the lean years arrive. On the other hand, when, for any reason, the price is unusually high, the wheat speculators know that lower prices will probably prevail in the future, and so they sell wheat for future delivery, thus keeping down its price. This dealing in futures serves a double purpose. It carries over the surplus stocks of good years to make good the deficiencies of poor years, and it keeps the price of wheat from wide fluctuations, which are always disastrous. It is by dealing in futures also that dealers and manufacturers can protect themselves against loss. Suppose a miller in Albany, on the first of August, wishes to have 10,000 bushels of Minnesota wheat delivered at his mill on September first. He buys 10,000 bushels in the Minneapolis market, and it is shipped down the lakes, taking a month to make the trip. If the price of wheat falls 5 cents per bushel during the month, the miller suffers a loss on his purchase because the price of flour falls also. In order to protect himself, he sells 10,000 bushels of wheat in the Chicago market, deliverable September first. If, now, the price falls 5 cents per bushel, the miller loses on his purchase of grain,

if he has bought it at \$1.00 per bushel, \$500.00, but he gains the same amount in his future sale, because he is able to buy the wheat that he sold at \$1.00, at 95 cents. The gain on the one transaction balances the loss on the other and the miller can make his expected profit on his flour. We hear a great deal of discussion about the evils of grain speculation, and there is no doubt that many people, who without much knowledge or experience attempt to forecast the future of the produce market, suffer severe losses, but in spite of these unfortunate practices, the operations of produce exchanges result in great benefit to the community.

(196) Methods Employed for Grain Typical of those used in other Industries

The methods employed for the collection of the product in the grain trade are typical of those in vogue in several other industries. Live stock is collected in practically the same way, although the purchase by the packing industry at the central markets is after individual inspection. The methods of dealing in meat products are substantially identical with those employed in the grain trade, and the operations are conducted on the same exchange. Cotton and coffee are graded and traded in on the exchanges. Petroleum is bought and sold by means of pipe line certificates, which are titles to given quantities of crude oil in the pipe lines or storage tanks of the transportation companies. As a general rule, wherever a commodity is so uniform in quality that it can be handled in large masses after suitable inspection; and wherever the necessity of keeping particular lots separate does not interfere with the establishment of a definite market price that applies without distinction to every barrel, bushel, pound, or bale of a given commodity, the method of warehousing and dealing that has been described can be followed.

On the other hand, wherever the commodity is not uniform in quality, as, for example, wool, where each state, and sometimes each ranch, produces a product widely differing from the wool of other localities; or in the case of lumber, or leather, or fruit—wherever, in short, the buyer must see the goods before he purchases, then, although the method of collection into wholesale markets and the methods of warehousing closely re-

semble those we have described, there can be no great uniformity of quality and price, nor any degree of "future" dealing. The price of such articles must vary within wider limits than those of uniform quality, and the expense of handling is much greater, since those who purchase these products and hold them for sale must be reimbursed for the risk which they take in carrying commodities of uncertain quality and irregular price.

THE COLLECTION OF LIVE STOCK

(197) Methods Employed in Collection of Live Stock

The methods employed in the collection of live stock also illustrate the general practice in the collection of materials. The cattle industry, whose location has already been discussed, is thoroughly organized even down to the fattening of the stock. A farmer in Nebraska wishes to buy 100 head of cattle and keep them over the winter. The cattle are worth in their present condition, \$2000. The farmer has the corn, and the shed and yard room. He goes to a cattle broker and borrows \$2000, giving the cattle as security. The cattle broker immediately sells this note to a bank, taking a commission for negotiating the transaction. The farmer buys the cattle, keeps them over winter and sells them for \$3500, turning \$500 worth of corn into \$1000 worth of beef. No one in this transaction takes any great risk; the broker and banker are each protected by the fact that the cattle are put in as security at a minimum valuation, and that, as their weight increases, the margin of safety increases also. Commission dealers have men constantly on the road inspecting cattle for new loans or to see that their security is being properly taken care of. Sometimes money is loaned not only to buy cattle, but to buy feed for the cattle, in which case the risk is greater, although, even here, there is an ample margin of security.

(198) Meat Trade

In taking up now the meat trade proper, we have to consider three things:

1. The sources of supply, which I have already reviewed at length.
2. The centers of concentration; where the surplus live stock is gathered and from which it is distributed.
3. The distribution of the meat from the central market.

The sources of cattle supply are as follows:

1. Texas, Oklahoma and Indian Territory, the southern grazing areas, where the ranch system still predominates;
2. Western ranches, Wyoming, Montana, the Dakotas, and Colorado;
3. Feeding states—Missouri, Kansas, Nebraska, Iowa, Illinois, Indiana, Tennessee and also Michigan and Wisconsin (southern part).

The relation between these sections has already been fully indicated. The grazing states raise the cattle and the feeding states put on the flesh.

(199) Concentration at the Distributing Centers

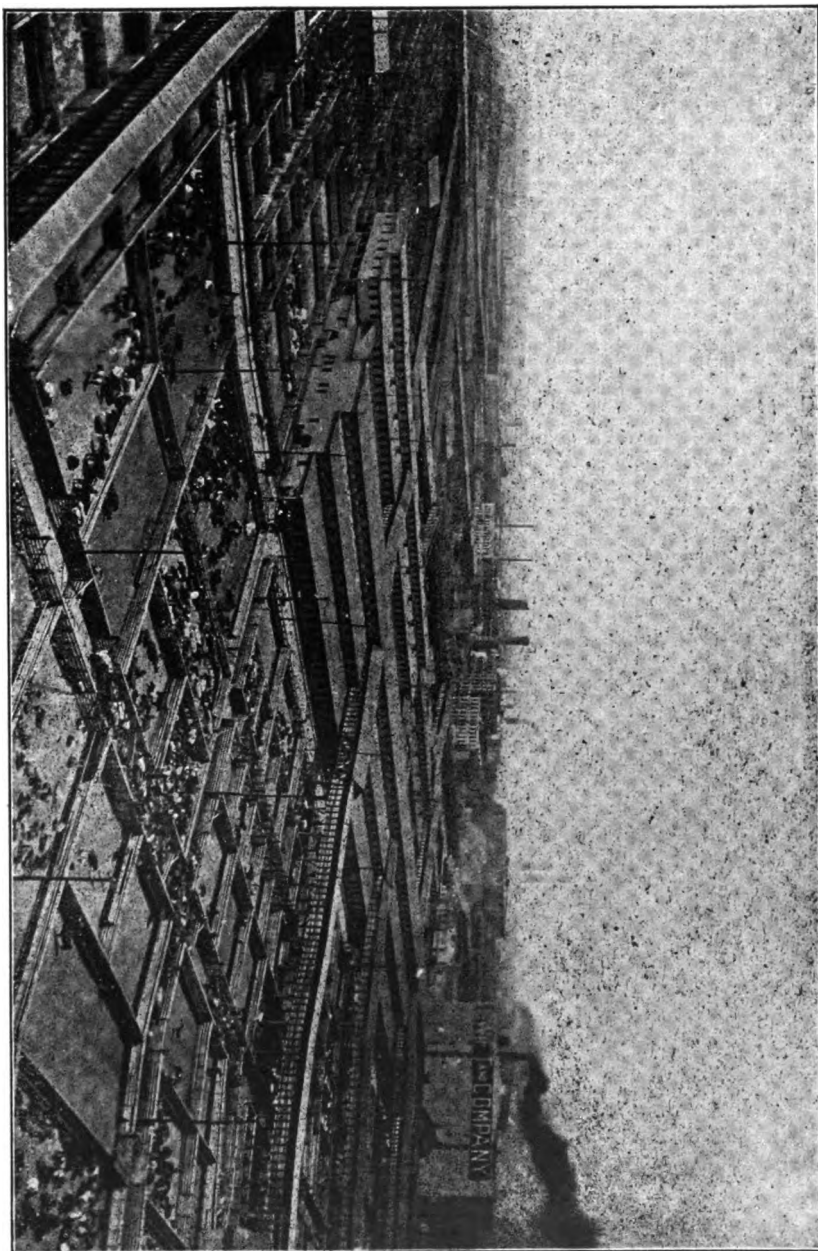
We next take up the question of concentration at the distributing centers, discussing this question in relation to hogs and sheep as well as cattle. The farmer usually ships directly to the central markets or sells to local buyers. The stock is shipped from the local stock yards, which consist of small yards with chutes, or inclined run ways; up these chutes and into the cars the stock is driven. Fifty hogs make a car load, hogs being shipped mainly in double deck cars. Fifteen to eighteen cattle make a car load, and are packed as closely as possible, there being danger that the cattle will be trampled to death if they lie down. All live stock, when the distance is more than one day's travel and when the local accommodation trains will not suffice, is brought in on stock trains. The regular stock trains make very good time. On the roads in the Northwest cattle trains are given the right of way. Every regard is paid to the shipper to make sure that his cattle get through in good condition. Stock may even be unloaded and rested at certain points, and is regularly fed and watered. The shipper is allowed to send his men along with his stock and free transportation is given to return. The attendants help each other, as for example with hogs, which are given to piling up in the car.

(200) The Method of Loading and Unloading Stock

As a rule, the stock is shipped to commission men at the various centers, where it is dealt in at live stock exchanges. The stockman very rarely consigns to himself, but he keeps well posted as to the market. Only the commission men and the agents are admitted to the live stock exchange. When the stock gets into the yard it is taken in charge by the yard people, who unload, weigh and register according to brand, breed, owner, etc. Anyone wishing to buy has access to these registers, and they are made the basis of all transactions. The agent or commission man has entire control and can refuse to sell if the price does not suit him. When the cattle come into the yards, they come along a platform elevated to the level of the car door. This platform chutes into yards, from which the cattle go into the receiving pens. Before they enter the yards, however, they are carefully inspected by the government officials. All dead or maimed animals are hauled out on the platform and reported. Any traces of disease, such as Texas Fever or lumpy jaw, causes the whole consignment to be condemned. The yards are subdivided into localities for the different breeds of animals, and these are again divided into blocks. Between all parts of the yards there is a perfect system of communication.

(201) Methods Employed in Dealing, Rules of Inspection and Trading

The methods employed in dealing in the stock at the yard, with the rules of inspection, are as follows: A representative of the company, that is the Union Stock Yards, is there and makes a note of this, say, in chute pen number 16, C. B. & Q., car 25,634, twenty cattle to A. Rosenbaum & Company, that being the name of the commission merchants to whom the stock is consigned. All stock is consigned to commission merchants for selling rather than directly to the buyers. A representative of Rosenbaum & Company now goes to chute pen number 16 and takes the cattle therein enclosed to some one of the pens assigned to his company, giving a check to the Union Stock Company of pen number 16, in block D, pen number 2. In this way a complete record of the cattle is kept. Here the cattle remain until the next morning, when the buyers of the big pack-



STOCK YARDS.



ing houses come out to inspect them. There they meet with the seller from Rosenbaum & Company. When they finally agree upon a price, the cattle are weighed by a man who is under oath to the Union Stock Yard Company not to favor either the buyer or the seller. The weigh master writes or makes four copies of the record of the weight, etc., of each draught of animals passed over the scales, one of such records being in his permanent record book; the other consists of the detachable fac-simile reference record for the use of the buyer's helpers at the scales. This second record is placed on file for inspection, thereby avoiding interference with the weigh master's book, and the third and fourth copies are fac-simile certificates issued respectively to the buyer and seller; one of these certificates forms the basis of the buyer's accounts, and the other, the basis of the seller's accounts.

Thus each of the parties interested may possess an official fac-simile of the scale record in which the weights shown are copied directly from the scale beam, the four copies being simultaneously produced by the same stroke of the pencil under the hand of the authorized weigh master who did the weighing, and each bearing his official signature. In this way a vast amount of labor is avoided, and the work is much more accurate as well, since all of the copies must of necessity be alike, no transfers being made, and all discrepancies and transpositions being avoided.

(202) Charges for Stock While in the Yards

The cattle are now taken to the pens of the buyer, where they await slaughter. For unloading, weighing and taking care of the stock while in the yards, the Union Stock Company charge 25 cents per head for cattle, 15 cents per head for calves, 8 cents per head for hogs, and 5 cents per head for sheep. This covers all charges except feeding as long as the cattle remain in the pens; but it is naturally the object of the commission merchants to sell their cattle as soon as possible, thereby avoiding shrinkage. The price charged for feed is: Timothy hay, \$30 per ton; ordinary hay, \$20 per ton; corn, \$1 per bushel. The original price includes watering.

All sales are "word of honor sales," as the saying is, there being no document to compel the buyer or the seller to carry out his agreement; because the sales are usually made long before the weighing takes place, and the original buyer and seller are usually not present at the weighing, so that there is room for dishonesty; but this rarely, if ever, occurs.

(203) Chicago Live Stock Exchange

The Chicago Live Stock Exchange is organized very similarly to other exchanges, establishing the minimum commission rates, rules for buying and selling, etc. The following is a copy of the rules for trading, commission rates, cattle inspection and rules governing the humane handling of live stock:

(204) Commissioners and Solicitors

Section 1. The commission for selling live stock shall not be less than the following named rates:

Section 2. Fifty cents per head for cattle of all ages, up to \$12 per carload; provided, that veal calves in less than car lots shall be charged not less than 25 cents per head. Double deck cars of calves, \$18 per double deck.

Section 3. Six dollars per carload for single deck carloads of hogs or sheep, or hogs and sheep, and \$10 per carload for double deck carloads of the same. When part of a car is double decked and loaded with hogs or sheep, or hogs and sheep, the commission for selling such fractional upper deck shall be 15 cents per head up to \$10 per carload.

Section 4. Forty head or more of hogs or sheep, or hogs and sheep, arriving at these yards in a single deck car shall not be considered as a mixed car, but shall constitute one carload to be charged \$6. For stock arriving at these yards in less than carload lots, 50 cents per head for cattle, 25 cents per head for calves, under forty head of hogs or sheep, 15 cents per head.

Section 5. Different species of live stock in a single car:

Cattle per head, up to \$12.00 per carload	\$.50
Calves per head, up to \$12.00 per single deck carload	.25
Hogs per head, up to \$6.00 per single deck car	15
Sheep per head, up to \$6.00 per single deck car	15

The commission on mixed live stock shall be governed by this section up to a charge of \$12.00 per single deck carload, and \$18.00 per double deck carload.

When part of a car is double decked and loaded with hogs, or sheep, or calves, the commission for selling such fractional upper deck shall be at the rates herein established for selling single decks of mixed stock.

Section 6. The commission for purchasing live stock shall not be less than the following named rates: Stocker and feeder, cattle, including calves, per head, but not to exceed \$10.00 per carload unless the parties in connection with a loan or advancement, agree to pay per head, without regard to the number constituting a carload lot\$.50
Stock and feeding sheep and lambs, per single deck carload 6.00
Stock and feeding sheep and lambs, per double deck carload 10.00

(205) Trading

Section 1. Members of this Exchange or their employes in consummating the purchase or sale of live stock on this market, shall agree upon all the terms of the trade at the time the sale is effected, and in no case shall any deduction, change or offset of any nature whatsoever be claimed or allowed other than such as is specified and agreed upon by and between the principals at the time the trade is made. Nothing herein contained shall be construed as in any way affecting or abrogating any rule now in force.

Section 2. The responsibility of the seller, as regards the condition and inspection of live stock, shall cease on all live stock sold at these yards as soon as said live stock shall have been driven from the scales, except as provided in Section 1 of this rule.

(206) Cattle Inspection

Section 1. No member or members of this Exchange shall buy, sell or dispose of, or weigh to any purchaser thereof, or cause to be bought, sold or disposed of, or weighed to any purchaser thereof, any animal apparently affected with actinomycosis, commonly called lump-jaw, or having any lump or swelling upon the head or neck, until the said animal has been in-

spected by the State Veterinarian or Assistant State Veterinarian; and such inspection shall be made prior to the time when such animal is weighed, or, if not weighed, then before it is delivered. Only such animals as the veterinarian shall pronounce to be free from the said disease shall be accepted and paid for by any member who may have purchased the same. In case of failure of purchaser, seller or veterinarian to note such diseased animal or animals before or at the time of weighing, then such animal or animals shall be at purchaser's risk.

Section 2. Members of this Exchange having possession or control of any animal or animals apparently affected with the said disease, or having any lump or swelling upon the head or neck, shall call on the State Veterinarian for inspection of such animal or animals; and if upon such inspection such animal is found to be free from disease the member or members having such possession or control may proceed to sell or deliver said animal in the regular course of business; and said animal shall be accepted by any member purchasing, or who may have purchased the same. If such animal shall not be so passed nor found free from disease, but either shall be condemned by said Veterinarian or Assistant State Veterinarian, or shall upon such inspection, alive or upon foot, be deemed doubtful by him, such animal shall not be bought, sold nor otherwise disposed of by any member of this Exchange, on foot or alive, nor shall the carcass of such animal, nor any part thereof, be bought, sold, or in any wise disposed of by any member of this Exchange, unless and until there has been a post-mortem examination thereof by said Veterinarian and the said carcass has been by said Veterinarian, after such examination, deemed and declared to be healthy and fit for food.

Section 3. Any member convicted of a violation of this rule shall be fined \$50 for each animal so bought, sold or disposed of by him or his agents before inspection.

(207) Governing Humane Handling of Live Stock

Section 1. Any member of this Exchange having in his employ any person who may be found guilty of striking, pounding or prodding any animal in the Union Stock Yards of Chicago, thereby crippling, bruising

ing or damaging such animal, shall be fined ten dollars (\$10.00) for each offense, two dollars (\$2.00) of which fine shall go to the party furnishing sufficient evidence to secure a conviction and eight dollars (\$8.00) of said fine to be covered into the Treasury of the Exchange.

Section 2. Any employee of any member of this Exchange who may be convicted of a violation of this rule, shall not be employed by any member of this Exchange, for thirty days next succeeding the date of such conviction.

Section 3. Any member of this Exchange who is not an employee who may be found guilty of striking, pounding or prodding any animal in the Union Stock Yards of Chicago, thereby crippling, bruising or damaging such animal, shall be fined twenty dollars (\$20.00) for each offense, five dollars (\$5.00) of which fine shall go to the party furnishing evidence to secure a conviction, and fifteen dollars (\$15.00) of said fine shall be covered into the Treasury of the Exchange.

(208) Centers of Distribution and Packing

The centers of distribution and packing are as follows: Chicago, Kansas City, Omaha, St. Louis and St. Joseph, the last four having developed since 1860, while Chicago first achieved prominence during the war. In 1899, the total receipts of cattle at these five centers were 6,615,000; of hogs, 16,872,000; and of sheep, 6,492,000. Of these, the quotas received by the different cities were as follows in 1900:

	Cattle.	Hogs.	Sheep.
Chicago	2,729,000	8,109,000	3,548,000
Kansas City	1,969,000	3,094,000	860,000
Omaha	828,000	2,200,926	1,276,775
St. Louis	698,000	1,791,000	416,000
St. Joseph	380,000	1,678,000	290,000
	6,604,000	16,872,926	6,390,775
In 1884 the receipts were as follows:			
Chicago	1,817,000	5,351,000	801,000
Kansas City	533,000	1,723,000	237,000
Omaha			
St. Louis	390,000	1,079,000	277,000
St. Joseph			
	2,740,000	8,153,000	1,315,000

It can thus be seen that Chicago is falling off in comparison with the Missouri River markets. Of these Kansas City and St. Louis stand nearest to the southwestern cattle supply and Omaha and St. Joseph stand nearest to the northwestern ranges and to the sheep supply. These four cities are in the corn belt. (Explain again how they gather up the cattle in the summer and distribute them out through the corn belt, gathering them in again in the spring.) This explains why Chicago is losing importance as a receiving center. Chicago, however, still retains its pre-eminence as a shipping point for dressed meats, because nearly all the railroads converge at that point. There is little gained on this account, however, by the industries of that city, because the meat sent from the West goes right through, being put up in its final form in the Western packing centers.

SECTION 6

ORGANIZATION AND MANAGEMENT OF INDUSTRY (Continued)

(209) Specialization of Industry

The first question is, what industry shall be chosen? The discussion of the causes which influence men to go into business, however, belongs to the province of Corporation Finance and has been treated in another place. It suffices upon this point to say that those industries which offer the largest margin of profit are most sought after at any given time. These may be either long established industries, or new industries based upon patented or secret processes. In general, it is the new industry which offers the largest margin of profits, even the production of toys or fancy articles, which satisfy the popular taste at the time and in which a fortune may be made before others can enter the field to share the large profits. It is also to be observed that modern industry inclines more and more to specialization; to the manufacture of a single article, or the carrying through of a particular process in a given mill.

(210) Industries Tending to Specialize in Production of One Thing

No matter what the industry may be, cotton, woollen, leather, glass, or copper manufacture, the tendency to specialize in the production of one thing is on the increase. The reason is as follows: Specialization means that the entire energies of the mill-force are concentrated on the production of one thing, which enables that thing to be produced at lower cost than if a number of articles were produced under the same roof. A factory, just as a man, can do a few things much more efficiently than many things. "Jack-of-all-trades and master of none," is as true of large enterprises as of individuals. For the same reason, specialized industry finds a readier sale for its products. A mill becomes known in a certain line because it turns out only one thing; and when a particular article is wanted, the name of that mill at once arises in the buyer's mind. A minor advantage of specialized industry, which is often, however, of great importance, is that the surplus stock of such a plant, consisting as it does of only one kind of goods, is much more available for quick deliveries and to satisfy sudden and urgent demands, than when the stock includes a number of articles, in which case any extra demand will soon exhaust it, and compel the company to decline orders, and thus lose custom.

(211) Location of a Plant Important

After the line of production has been settled upon, the next problem in starting a new industry is the selection of a site. The location of a plant should be, above everything else, healthful. The employees cannot do good work under unwholesome conditions. As between city and country, it is usually unwise to take either alternative. In the heart of a city, rents are apt to be high, and desirable locations are taken. In the country, on the other hand, it is difficult to secure and hold a working force, for the workmen, who must be taken from the city, do not enjoy the loneliness and isolation of country life. The most satisfactory location is in the suburbs of a city where there is plenty of cheap land, and where, owing to the development of rapid transit, employees can be secured without difficulty, which allows them to run into town at any time.

(212) Buildings and Machinery

When the location has been determined upon, the buildings and machinery are erected. Buildings are usually erected by contractors, although some firms and companies build their own extensions. Machinery is always purchased from machine builders. If new machines are wanted, specifications of design are furnished. It is usual, in allotting contracts, for bids to be opened and the contract given to the bidder offering the most favorable terms. The successful bid is not always, however, the lowest bid. There must be ample assurance that the bidder to whom the contract is given, will be able to complete the work in the time agreed upon; and this assurance the lowest bidder is not always able to furnish. The reputation of the contractor or machine builder for thorough work, as well as for rapid work, is also taken into consideration.

(213) Kind of Power to be Used

An important question in this connection concerns the kind of power which will be chosen. If water power is available, it is possible to make choice between four kinds of power: Water power; electric power, generated by water, steam, or gas; steam power, generated by gas or coal, and gas power exerted in the gas engine. As was shown in another place, water power is usually chosen when it is available. Where a mill site cannot be obtained near the water power, it may be converted into electric power in a dynamo and sent over a wire to operate a factory sometimes 30 miles distant. Electric power is widely used in connection with steam for operating a number of single machines. Each machine can have its own motor and when a machine stops for any reason, the others can go on. The gas engine has the advantage that no fireman is required and that very little attention is necessary, while where cheap gas is obtainable, the cost is less than that of the steam engine. In most cases, however, because of the universal cheapness of coal, steam is the power selected. Then arises the choice of coals—for there is a large number of varieties on the market—and the length and terms of the coal contract. Competition is so active in the coal business that shrewd buyers can often obtain sub-

stantial reductions from current prices by playing off one agent against another. Coal, as a rule, is sold by commission agents, who often represent more than one coal company, so that they are able to offer the buyer a variety of choice. The question regarding the choice of machinery, especially as between new and old styles of mechanical appliances, always arises at the outset of every new enterprise. The manager of a new enterprise, if he is wise, will avail himself of the great advantage that he possesses in being able to select the newest and best of everything. His competitors, on the other hand, who have been long in the field, are often prevented by the fear of sacrificing a portion of their investment, from introducing new and improved machinery and devices.

(214) Collection of a Labor Force

The next question is the collection of a labor force. If times are dull; if the industry is one of long standing; and if the plant is located in or near a large center, there is little difficulty. Advertisements in the daily papers are sufficient to bring more than a sufficient number of applications. These applicants, if they are skilled workmen, are expected to bring references or letters of recommendation from former employers. Sometimes a force of workmen can be moved from one town to another when the industry in which they are employed is moved. Application is sometimes made to employment agencies, or better, to the employment bureaus of labor organizations to furnish the required number of workmen. The selection of superintendents, technical experts, heads of departments, and foremen comes usually as a result of advertising or from personal connections of the owners.

(215) Supplying Materials

The question of a supply of materials next arises. The method employed in buying coal has already been described, and some reference made to the methods used by some large companies for supplying themselves with materials from their own mines and forests. In the same connection, however, it was shown how most industries must buy their supplies in the markets. For this purpose, a buying department is organized, sometimes divided among several men, each responsible for par-

ticular materials. The buyer must be a man thoroughly conversant with the details of the industry for which he purchases, so as to be able to select intelligently. He must also be familiar with market conditions in the articles that he buys; and he must, of course, be a shrewd and adroit bargainer, in order to get the best terms possible from the different agents who approach him for orders. Associated with the buying department in most large industrial establishments, is the inspection department where samples of the materials bought are carefully tested according to recognized standards.

Sometimes, moreover, the functions of the buyer are entirely subordinated to those of the inspectors. The inspector makes out specifications of the steel, or oil, or lumber wanted, and the buyer merely invites bids on the basis of the specifications, having no choice but to accept the lowest bid, the conformity of whose samples with its own specifications, is judged and determined according to physical or chemical tests by the inspectors.

The importance of inspection is steadily increasing in all large establishments; and when the inspection department has been fully developed, the buyer has very little to do and can often be entirely dispensed with, the remainder of his duties being assumed by the inspector. With the buyer and the inspector is the storekeeper, who receives the goods purchased and delivers them when called for to the various departments of the mill. The storekeeper notifies the buyer when a particular stock is running low, and the buyer, from these calls, constructs his "want book" or "want card," which he consults when approached by salesmen.

(216) The Operation of the Mill; Factory Bookkeeping

Having selected a location, erected buildings, installed machinery, selected power, contracted for fuel, collected a labor and superintendence force, and provided for a supply of materials, the next step is the operation of the mill. The question of factory bookkeeping, which should be considered next in order, is fully discussed in the first book of this series. It is merely necessary in this place to indicate what the superintendent of a mill, the man who is responsible for its management, desires to know from its books. He must know accurately the cost of

materials, the cost of manufacturing those materials into the finished product, and the cost of selling. The difference between the sum of these three costs and the price of the product is the margin of profits, out of which interest and dividends are to be paid. The books of a mill should show, not merely the total cost of each yard of cloth or machine that it turns out, but the cost of each step in the process should be shown also, and, in addition, this cost should be analyzed, and their respective shares should be assigned to labor and to machinery. When the superintendent has these facts before him for a series of weeks or months, he is in position to know exactly where improvement or correction can be made. If the labor cost at a certain stage of the process shows an increase, the cause can be ascertained and removed. It may be the fault of the workmen, in which case the foreman can be instructed to urge the men to more work, or it may be due to the machines being run at a lower speed than it is possible to run them, in which case the cause can be detected and the trouble remedied. A proper system of cost keeping also enables the superintendent to experiment with new machines or methods, and to determine the exact measure of success which has attended the experiment. The value of a proper system of mill bookkeeping is now coming to be recognized, and progressive managers are paying a great deal of attention to this part of their work.

(217) Information Bureau

Closely connected with cost keeping in the management of a mill, is the information bureau. Every large and well managed establishment now employs men whose sole business is to find out what is going on in the industrial world that would be of interest to their company to know. New supplies of material, new machines and processes, new methods of cost keeping, new labor regulations, new companies in the same line of business,—all these facts a progressive superintendent desires to know, in order that he may guide the policy of his own company in accord with the changing conditions of the industry in which it is engaged, and adapt himself to new conditions. One large steel concern in the United States is reported to pay to the head of

its information bureau a salary of \$80,000 per year, and it is further stated that the company considers his services worth several times the salary that he receives.

(218) Repairs, Renewals of Old Machinery, Introduction of New Machinery

Next in order of the problems confronting the superintendent, is that of repairs and renewals of old machinery, and the introduction of new machinery. Concerning the first two matters, little need be said. Everyone knows, from personal observation, that tools and machines, in order to do good service must be kept in good repair. A farmer who allows his machinery to stand out in the field all winter is apt to have serious trouble at harvest time; so with the manufacturing plant. Every well managed mill spends a great deal of money on repairs and replacements, and the object of a capable management is to leave the plant in as good condition at the end of the year as it was at the beginning. Beyond these considerations, however, there is the question of new machinery, which if introduced must often displace other machinery still in good condition and able to do service, it may be, for years. To discard this means a double expense. Suppose the old machine cost \$5000, and is worth, allowing for its wear, at the present time, \$2000. The new machine will cost \$4000. To make the change, therefore, will mean a sacrifice of \$2000; for old machinery sells for a mere fraction of its original cost, and a cash outlay of \$4000 plus the cost of taking out the old machine and putting in the new one, a cost which is often considerable. On the other hand, it can be urged in favor of the new machine that it will do work at 20 per cent. less cost than the old machine; and that, in addition, the product will be of a better quality. This question of substitution the progressive superintendent decides by answering the following question. Will the net cost of making the change, that is to say, the value of the old machine plus the cost of removal and installation, and less the amount realized from the sale of the old machine—either for the same uses, or as scrap iron—say \$12,000, be repaid by the profits of the new machine within the time during which the old machine can still be used; in other words, suppose the old

machine would last five years, losing \$400 of its value every year, will the increased profits resulting from the 20 per cent. lower cost of production with the new machine amount to \$2500? Then the change would certainly be advisable.

It might even be wise to sacrifice a present value of \$2000 in the old machine though the increased profits should amount to less than \$2000, and supposing that there should be no increased profits resulting from the change. This would be true when it was necessary to substitute a new machine capable of making a better article in order to hold the trade. In such a case, there can be no question that the change in machines must be made for fear that competitors will be more progressive and capture the market in the article in question. This second condition is the one usually met with in American industry. If a business is to succeed, it must be progressive or else its rival will take its trade. For this reason, most well managed industries throw away, every year, valuable machinery because something better has been discovered. As a general rule, this policy is wise, even though it results in present loss, for the progressive firms and companies usually make up in increased business what they lose by discarding old machinery. One of the reasons for the astonishing success of the Carnegie Company was the resolute pursuit, throughout the term of Mr. Carnegie's control, of this policy of displacing old machinery in favor of new.

(219) The Personal Management of a Mill

Having discussed some of the general questions of the mechanical arrangement and management of the mill, we now turn to consider what may be termed the personal management, the direction of the labor force, in such a manner as to secure the largest output at the lowest cost. Under this topic, the following subjects will be considered: (1) The manner of appointing foremen and heads of departments and the relations of responsibility in the mill; (2) the hours of labor and the question of time wages versus piece wages; and (3) the relations between employers and employed. These subjects do not by any means embrace the entire field of personal management, but their con-

sideration will call up some of the more important matters among those which could be discussed.

(220) Methods of Selecting the Heads of Departments

Two methods can be followed in selecting the heads of departments. The foreman and especially the heads of departments are responsible to their immediate superiors for the amount and quality of the work that is done under their direction. They may be promoted from the ranks as vacancies occur, or they may be appointed because of their relationship to superiors, or through personal connections of one kind or another. In the contrast between these two methods, often lies the difference between success and failure. The success of any business depends finally on the exertion of labor and intelligence by the wage earners. The more diligent and energetic are the employees, the greater will be the difference between the value of that which each workman produces, and the amount of wages paid him, that is to say, the larger will be the profits made from his labor. No man will exert his full strength merely because he receives good wages. The main spring of human action is ambition, hope, the desire to better one's condition, to get ahead of one's fellows, to rise in the world. Only by holding out the hope of rapid advancement to a man, can he be induced to do his best, and sometimes a little better than his best. The hope of promotion, of becoming a foreman, a department manager, the superintendent of a mill, the manager of a great business, with all the increased earnings and the distinction which high positions carry with them; these are the inducements which can drive a man to do his best in order to deserve well of the company for which he works.

(221) Promotion from the Ranks Most Successful

Those business enterprises which fill their highest positions from the ranks are in the long run most likely to succeed. Every workman in a factory cannot be its superintendent, but each one can aspire to that position, and the sight of the advancement of his fellow workman, if the selection for promotion is fairly made, inspires every one to do his best—to do a little

more than his duty. There is another and a more direct advantage from pursuing a policy of promotion from the ranks to positions of responsibility, and that is the intimate knowledge possessed by the foreman and heads of departments of every detail of every process—a knowledge acquired by personal contact with the processes in question. The Carnegie Steel Company has, from the beginning of its history, made a practice of filling even its highest positions by promotion, and the success which it has won confirms the wisdom of the policy. On the other hand, it is equally certain that those companies whose high positions go by personal influence, relationship, and “pull” will be placed at a disadvantage compared with businesses that are well managed in this regard. Favoritism of this kind takes the ambition from employees, and officers who come in from the outside are seldom as efficient as those who come up from the ranks.

(222) Responsibility Assumed by Different Officials

As regards the degree of responsibility that is assumed by different officials, it is now usual to give the widest possible liberty of action to the head of a department, and within a department the same liberty to individual foremen, judging them by results and interfering as little as possible with the means and methods by which those results are attained. It is, however, the custom to hold frequent consultations of officials, usually at a dinner or luncheon, where ideas are exchanged and suggestions given as to the possibility of improvement; but these consultations are not for the purpose of scrutinizing the management of a given department, but merely that the policy of the business may be improved by the interchange of ideas. In some establishments—the Carnegie Company again being the most conspicuous example—every employee of the company, from the high officials down to the laborers, are encouraged to offer suggestions and to devise plans for lowering the cost of production, which, if considered valuable, are paid for either in cash or with promotion. The Carnegie Company further rewards diligence in its employees, by giving some of the best of them, each summer, a trip to Europe, where they not only enjoy the

tour but take occasion to familiarize themselves with foreign methods in the iron and steel industry.

(223) Hours and Amount of Labor

The question of hours of labor and of amount, time and manner of wage payment includes a variety of considerations, of which only the most important can be touched upon in this place.

The regulation working day in the United States is 10 hours, although on government work 8 hours is taken as the standard, and in several trades, notably the building trades, fewer hours than ten are the rule. Some trades also work longer than 10 hours, as in the street car service. It is generally believed that 10 hours is a sufficient working day, and a growing sentiment favors a reduction of this time to 9 or even 8 hours per day. The compensation for the loss of time involved in the shortening of the working day, it is claimed, is found in the greater energy and care which the workman is able to give. The hours of labor were formerly much longer than at present, reaching 12 hours in all industries, and in some amounting to 14 and 16 hours. It is undoubtedly true that an actual increase in the daily output of the workers has resulted from the reduction of the labor day to its present length. Whether a further reduction of hours would be offset by an increase of efficiency is not so certain.

(224) Amount of Wages

The amount of wages that an employer should pay is a question that has been discussed from the time wages were first paid. The employer was accustomed to consider the matter in this fashion: "My product sells for, say, \$200,000 per year. If I pay my employees \$125,000 instead of \$100,000, my profits will be reduced by \$25,000. If, however, I can reduce my wage bill to \$75,000, my profits will be increased by \$25,000." Employees, on the other hand, saw no reason why all the profits of the employer should not go to them as wages, nor could they understand the justice of a system which made them toil to put money into another man's pocket, who, it may be, so far as

they could see, did nothing to earn it. Both sides, we have come to realize, were wrong in their opinions. Unless a man is paid such wages that he can maintain his family, keep his children in school, and lay up something for sickness or old age, he cannot reach his highest efficiency as a workman. It is as necessary that he should be well fed, clothed and housed, and that the future to him should be full of hope, as that he should have good tools and machinery with which to work. To the employer, men and machinery are the means of production, and one of these factors is equally efficient with the other. The idea of a living wage now generally prevails among employers. Skilled labor in the United States generally receives from \$2.00 to \$3.00 per day. The first figure is too low for city life, and the second is by no means excessive. Many trades pay higher wages than these. In the building trades, for example, wages of \$4.50 to \$5.00 per day are often paid in the cities, but these trades do not offer steady employment; stone masons, for example, being idle during the winter months; so that on the average the building trades do not pay higher wages than the other occupations of skilled labor.

(225) Attitude of Workmen Towards Employer

In regard to the attitude of the workman toward the employer, there have been fewer concessions of opinion made. The workman is still inclined to resent the large profits of the employer as being taken out of the wealth which he, the workman, has created by his labor. It is only necessary to point out, in this connection, that without reasonable profits, enterprises will not be kept up to give employment to workers; and also that large profits are apt to encourage a rapid growth of the business in which they are made, and this increases the demand for workers and tends to raise their wages. The most successful business enterprises are those in which both wages and profits are high.

(226) Manner of Wage Payment

In regard to the manner of wage payment, two general differences may be noticed. Wages are either paid by the day or

hour, or by the job or piece. The first method of payment is called time wages, and the second, piece wages. The advantages and drawbacks of the two systems are as follows: When a man works by the day or hour he has no inducement to exert himself to the utmost; to use his full strength and energy in the service of his employer. He is content to plod along, taking his full time, keeping busy if he is a faithful workman, but not doing as much as he is capable of doing; nor can the foreman compel him to fully exert himself. On the other hand, when careful work is required, it is often an advantage that the workman should take his time; and in those occupations where the worker is wholly subordinate to the machine, when he walks back and forth with a spinning mule, or feeds steel bars into a screw machine, or watches an engine, the time of labor is the only possible basis of payment.

(227) The System of Piece Wages

In the skilled occupations, however—the building trades, the machine tool industry, the industry of glass blowing—the amount of the product, and therefore the labor cost of each unit of product depends very much on the energy of the worker. In some trades, it is claimed indeed that the individual output can be doubled if inducements are offered sufficient to make the workman do his best. This end of increased output is often sought to be attained by means of piece wages. Under this system, the more a man does the higher are his wages. Under a system of piece wages, it would appear that the workman had every incentive to do his best. But a difficulty at once arises. The ordinary method of changing from time to piece wages is to compute the average production of each man in the shop; so many patterns cut, so many surfaces planed, so many armatures wound for each individual—and to divide this product into the daily wage, the quotient being the average payment under the system of time wages for each piece. This is made the standard, and the men are paid at this rate according to the amount they do.

The result of the introduction of piece wages is to quicken most of the employees to greater exertions and the output of

the shop is proportionately increased. Now observe what happens. The greater part of the cost of the product in such industries is the cost of labor. The smaller part is the cost of machinery. By the greater speed of the machines under piece wages, the employer gains; but he gains nothing at all from the increased speed of the workmen—all the gain from that source goes to the men. The employer feels that this is an unfair division. He is also surprised to see that some of his workmen under the new system have doubled their wages, showing that they were not doing their best under time wages. What more natural than for him to insist upon a lower piece rate, and what more easy than to gradually lower the piece rate until the workman at his top speed, to which he has been stimulated by the inducement of higher wages, is earning no more than before the new system was introduced. Indeed, employers have been known to congratulate themselves on having discovered, by changing to the piece wage system, just how much their workmen could do. The injustice of this proceeding, from the point of view of the wage earner, is plain. He feels that he has been deceived. After being encouraged to over-exertion by the promise of higher earnings, he finds that he is making little if any more than under the old system. He may, in fact, be working much harder for the old wages. For this reason, piece work is generally disliked by skilled workmen, even when they work under that system.

(228) Premium System of Wage Payment

A compromise between the two methods of paying by the hour and paying by the job is afforded by the premium system of wage payment. This system starts from an assumed fixed cost for particular pieces of work, a cost based upon the average speed and capacity of the shop or mill. For any reduction of this cost, in the increased speed of a workman, a premium is paid amounting to a certain portion—a half or two-thirds—as the case may be, of the saving which the workman has made by his greater diligence. The remainder of the saving goes to the employer. The system has been introduced in many places, but has met with opposition from the workmen, who feared that it

was a system of piece wages in another form, and have usually resented its introduction. There seems to be little doubt, however, that this system, or some modification of it, will increase its hold in the shops and mills. The system of time wages, which reduces all to the same level, and which fails to get from the workmen all that they are able to do, is opposed to industrial progress. The system of paying according to work done, however, is in line with the spirit of the modern age, which demands that each man should be rewarded according to his individual merits.

(229) Time of Wage Payment

The time of wage payment is in many states prescribed by law. The almost universal rule is weekly payment of wages and monthly payment of salaries. Saturday night is the time generally taken to pay wages. Many employers pay on Monday night in order to discourage, as far as possible, the spending of the week's wages in the saloons on Saturday night. The method of payment is usually in currency, although sometimes checks are employed. Workmen prefer cash on account of the trouble of cashing checks.

(230) The Company Store System

Many industries situated in outlying sections, especially mining companies, carry on what is known as the company store system. The company owns a general store in connection with the mine, and all its employees are expected to trade at this store. If an employee does not comply with the request, while the laws of most states forbid any coercion in the matter, and indeed, generally prohibit the ownership of supply stores by coal-mining or other companies, the obstinate individual is likely to be dropped at the first opportunity; although some other reason than the true one must be given for his discharge. For this reason, company stores, when the negligence of the authorities allows them to exist, are well patronized. A well managed company store will not charge higher prices than other stores and its goods will be of fair quality. Its gains, however, as compared with those of retail stores that must struggle for

business, and must often give large credit to their customers, and incur heavy losses because of bad debts and slow collections, are very large. In the soft coal regions of Pennsylvania the profits from the company stores are stated to average 20 per cent. The method of operation of a company store is as follows: On pay day, when the men present their time or tonnage checks for payment, they are handed a statement of the amount they have purchased at the company store since last pay day, and the amount is deducted from the wages due them. This system is only possible in isolated communities or small towns. In a large city or even a town of moderate size, it is impossible to exert such control over employees, and these company stores are slowly disappearing from the mining regions.

(231) Relations Between Employer and Employee

This subject belongs rather to the field of Sociology than to that of business management; but owing to its bearing upon the management of industry, it will here be considered. It is a proposition almost self-evident that the employer's interest is furthered by his possessing the good will of his employees. No man will work so well for wages alone, as he will work when, in addition to the wages he receives, is added the consciousness that his employer is interested in his welfare; that he will promote him as fast as he deserves it; that his employer will care for him in sickness, and, so far as possible, look after his family in case of his own death; that his sons will have the preference when vacancies occur in the mill; that he will be fairly paid for over time; that his wages will increase with the profits of the business, and, in general, that his employer will do to him as he, the employer, would be done by were the positions reversed. Many firms and companies bear just these relations to their workmen, and it need hardly be said that they do not lose any money by their policy of kindness. Few businesses are so large that the employer cannot know something of the circumstances of his subordinates, and friendly interest is an outlay which never fails to bring in large and quick returns.

Let us explain more fully as to particulars. The employer owes to his employees healthful surroundings; large and light rooms with plenty of air space and good ventilation, well

warmed in winter and when possible cooled in summer; he owes them the best of sanitary conveniences, and he will not go far astray if he provides lockers for their street clothing. He further owes it to his employees to protect them, as far as possible, from the risks incident to their occupation; to put railings about dangerous machinery, to case belts, and to put guard rails on stairs; to sand slippery floors, and to see that boilers are regularly inspected. It is an employer's duty to do these things, and for fear that short-sighted or penurious men should neglect to do them, the law insists that they shall be done, prescribes penalties for neglect to obey its commands, and employs inspectors to see that these regulations are obeyed. The employer further owes to his employees reasonable hours and living wages and he owes it to them and also to himself, to take a friendly interest in their welfare. These matters have already been noticed. The question now arises, shall the employer go further than this? Shall he do more than self interest directs; shall he provide libraries, gymnasiums, baths and amusements for his workers, as some employers have done and as most people think that all employers should do? There is no hesitation in answering in the negative. Philanthropy of this sort is altogether out of place and tends to pauperize the recipients. A man works for wages. The self interest of his employer and common friendliness and humanity demand that the worker be kindly treated and assisted in misfortune. But to go further than this is not demanded. It is far better for workmen to provide such things for themselves than that they should be presented with them. If living wages are paid, a margin will usually remain for luxury and amusement. Experience has shown that workmen prefer to take their wages in cash rather than in part cash and part philanthropy.

(252) The Liability of the Employer and the Employed in Cases of Injury

Another kind of relation between employer and employee is developed when the employee is injured in the performance of his duties. If the injury can be shown to be the result of his own negligence or the negligence of his fellow workmen, the law gives him no redress. If the arrangement of mill or machinery

was to blame, a suit for damages may be brought against the firm. The result of a damage suit against a rich man or a corporation can usually be predicted. The only question raised by the average jury in such a case is, "How much shall we give him?" An employer is thus justified in protecting himself against damage suits, which unscrupulous lawyers are always ready to encourage on the slightest pretext. Large companies often do this by maintaining a hospital in which injuries are attended to. Nearly every large employer pays a physician to look after such cases. The wages of the injured person are also continued and his place is kept for him. Considerate treatment, especially if relations between the two parties have been hitherto pleasant, and if the injury is plainly the result of the employee's carelessness or of the negligence of his fellow workmen, is usually sufficient to safe-guard the employer against a damage suit. Sometimes the employee, when he enters upon his duties, is required to sign a contract agreeing to accept certain compensation in case he is injured; and in other cases he agrees to the deduction of a certain amount from his wages in order that he may be insured against accident or disease.

(233) Importance of Discipline

The relations which arise out of discipline are of great importance. The chief offenses in a mill are tardiness, carelessness and laziness. If a man is always on time; if he works carefully, and if he exerts himself, no fault can be found with him, for his capacity has usually been tested beforehand. The cases requiring discipline in a mill, therefore, fall under these three heads. Most mills have a system of keeping time; either the time each man begins work is noted by an employee, or by an automatic device on which each workman is obliged to register the time of his arrival. Systematic tardiness, and absence without excuse are usually punished by docking the wages of the offender and eventually by discharge. The remaining two offenses, carelessness and laziness, are usually dealt with by reprimand, and, eventually, after the second or third serious offense, by discharge. It is not usual, even when their offense involves a serious loss to the firm, to punish mill hands by fines. The

amount of fine which could be collected would usually amount to a mere fraction of the damage, and the attempt to collect fines on any other principle than that of compensation for injury done, is certain to be looked upon as an injustice and to make dissatisfaction in the mill. It is not considered good policy to allow superior officers to abuse their subordinates when a reprimand is deemed necessary; for this injures a workman's self-respect, provokes his fellow employees, and usually fails to accomplish the object of the reprimand, which is the correction of the fault.

(234) The Relations Between Employers and Organized Labor

The final subject that will be considered under this general topic of the management of industry is the relations between employers and organized labor. Most of the skilled workers in the cities and larger towns of the United States are joined together in organizations called trades unions. The professed objects of these organizations are to cultivate a feeling of brotherhood and mutual confidence between workers in the same trade; to render assistance in sickness and misfortune; to assist members in finding employment for themselves or their children, and finally to work for the amelioration of the conditions of employment, which means to attempt to raise wages, shorten hours when necessary, and regulate the conditions under which work shall be performed. The method of organization is both local and general. The workmen in particular towns or mills elect officers and adopt the constitution and by-laws of the organization; and they have the right to send delegates to an annual convention which elects general officers and makes necessary changes in the constitution and by-laws of the organization. Unions whose names are familiar to everyone are "The Brotherhood of Locomotive Engineers," the "Amalgamated Association of Iron and Steel Workers," the "United Mine Workers," and the "International Typographical Union." The general line of action pursued by the unions is as follows: To limit employment in particular trades to their own membership, and to limit also in most cases, the number of apprentices who are permitted to learn the trade. Many unions have a label

which they require manufacturers to place upon a cigar box or on a hat, signifying that the article in question was made by union labor. Trades unionists generally refuse to buy non-union goods. They also attempt to influence legislation on labor questions, e. g., hours of labor, employment of prison labor, etc., by throwing the support of their organizations to candidates for public office who are known to be favorable to their demands. They inquire into the conditions of employment; sometimes limit the amount of work to be done in particular mills, and inquire into the reasons for discharging particular workmen. This system of oversight is carried on both by the local organizations and by traveling officials called walking delegates, who visit the different shops or mills at regular intervals, give advice to the local organizations, and, when necessary, report to the general officers.

(235) Manner of Conducting Dealings Between Organizations and Employers

The dealings between labor organizations and employers are usually conducted by shop or mill committees who present the requests or complaints of the men, and who direct the action of the organization in case of disagreement between the employers and the local organization. In some cases, the national organization assumes to act for the local union in matters of general importance, such as the rate of wages which is to be paid for the ensuing year. The weapon of defense and retaliation which the union possesses is the strike—a refusal of its members to work unless their demands are granted. This weapon is sometimes used with far reaching effect. The Anthracite Coal Miners' Strike of 1900 and the Steel Strike of 1901 are familiar examples. Employers in the United States are generally unfriendly to organized labor, claiming that they have a right to employ whom they please; and that they should not be dictated to by labor organizations who are irresponsible because they have no funds or property which can be levied upon. The workmen claim, on the other hand, that unless they are organized, they are at the mercy of their employers in the matter of wages and conditions of employment. They claim that

they must be organized in order to meet the employer on a basis of equality. The merits of the question are often obscured by foolish and arbitrary conduct on one side or the other as, for example, in the Steel Strike of 1901; but, on the whole, it must be conceded that the workmen have legal right to organize, and that being conceded, there is nothing left for the employer but to recognize the fact of organization and endeavor to keep on friendly terms with labor leaders. No one denies the value of the beneficial features of labor organizations, nor can it be denied that they have, in many cases, improved the condition of labor and instituted much needed reforms.

THE DISTRIBUTION OF INDUSTRIAL PRODUCTS

(236) The Method of Distribution

Few men can aspire to be large manufacturers. Every one can hope to keep a store. The art of store-keeping, or, rather, the general principles upon which store-keeping is based, are matters in which the student of business geography is naturally more interested than in any other subject that might be presented under this head. I shall discuss the subject of distribution under the following divisions: (1) The general organization of distribution; (2) the principles of retail store-keeping; (3) the growing tendency to eliminate all middlemen and to supply goods directly from the factory to the consumer, the question, in other words, of the future of wholesale and retail trade.

The goods have been manufactured at the factory and are ready for sale to the consumer. How is this process of sale to be accomplished? These goods are of two classes: (1) Those which are designed for use by other producers, such as crude iron and steel, boilers, engines, machines, woolen yarn and lubricating oil; and (2) those which are designed for personal use by individuals, such as flour, coffee, clothing, shoes and watches. The methods used for disposing of goods of the first class are

usually very simple. The manufacturer keeps an advertisement in the trade papers that deal with his line of business. He has attractive catalogues always on hand and he sends out representatives to call upon manufacturers and others who may use the goods that he manufactures.

The trade papers and the advertisements have a wide circulation and their advertising pages are seen by most of those who might be interested. These advertisements usually contain only the name of the article with the name and address of the manufacturer, and some brief description of the article advertised. As a rule no mention is made of the price; the quality and the merits of the article, being, however, described. Reference is also made to the catalogue which will be sent on application. A sample manufacturers' advertisement is given below:

**DIXON'S
PURE FLAKE
GRAPHITE**

saves horse power. Cools hot bearings. Prevents friction. Increases the lubricating power of all oils and greases, and is indispensable to every engineer and machinist in hundreds of ways.

For samples and full information address

JOSEPH DIXON CRUCIBLE CO.

Jersey City, N. J.

The manufacturers' catalogue is usually an imposing publication, fully illustrated and handsomely printed. This goes at length into the merits of the particular goods, shows wherein they satisfy the need, and sometimes how much better they are than competing products. This claim, however, is considered to be discourteous to competitors. Along with the direct claims of the article are printed letters from prominent men whose names are likely to carry weight with the prospective customer. No prices are quoted in the catalogue, but are made known by letter or in personal interviews with intending purchasers. The duties of the traveling representative are to see customers, and urge the value of the articles that their principals produce; and also, a most important function of the manufacturers' representative, is to look into the actual working of the machine which he represents and when necessary make suggestions to his principals for its improvement. The best advertisement that this class of goods can have is their quality, and the good service that they render. If they are thoroughly satisfactory, a reputation for excellence quickly attaches to them and also to any new goods which that particular company may put on the market. Mr. George Westinghouse, of Pittsburg, began with the invention and manufacture of the Westinghouse Air Brake. He next invaded the field of electric appliances, and has also taken up the manufacture of steam engines, gas engines and other machines and appliances. Each one of the articles that he manufactures helps to advertise the others.

(237) Method of Buying Employed by Manufacturers

The buyers of production goods pass on the merits of the goods presented to them, know what they want, and usually deal direct with the manufacturer. There is a very small field for the middle man in selling this class of goods and the field is constantly narrowing. The iron and steel broker, for example, formerly buying their supplies for consumers of crude iron and steel has almost disappeared. In general, the tendency in this part of the field of production is toward the cultivation of direct relations between producer and consumer.

When, however, we enter the field of consumption goods

as distinguished from those goods that are purchased for the purpose of production, the goods, in other words, which are purchased by everybody for their personal use—groceries, dry goods, hats, hardware, drugs and shoes—we come at once upon a fully developed system of distribution. We have the manufacturer's agent, the wholesaler and the retailer.

(238) The Growth of Domestic Industry

Fifty years ago the retailer, twice each year, came to the Eastern cities to purchase his supply of goods. Most of the manufactured goods were imported and were only to be had in the Eastern markets. Since that time, however, great changes have taken place. The growth of domestic industry has multiplied the number of factories. The products of industry have become much diversified. Take, for example, the different styles of shoes now on the market. Finally, the growth of the railways has made transportation and communication extremely easy. The result of these three causes has been (1) to specialize industry; (2) to make it very easy to reach the consumer; (3) to compel the seller to search out the buyer lest his competitor may take the first train and rob the first man of a customer.

The first of these causes is responsible for the development of the wholesaler or jobber, who now stands between the manufacturer and retailer. The reasons are as follows:

(239) Specialization of Factory

In order to produce at lowest cost, a factory must be specialized. A manufacturer cannot, with advantage, add wire, axes, can-openers, screws, knives and saws to his list of products. The process of manufacturing a saw, for example, involves twenty-five separate operations, which require a large plant with several departments and which also demand specialized machinery and skill. The process of manufacturing wire fencing requires entirely different machinery and differently trained workmen. The manufacture of a pocket knife differs entirely from the two processes just mentioned.

The more specialized the industry, the more economical is its production and the greater are its chances of success. These

goods must be sold to the people through the hardware retail dealers scattered throughout the country at the cross-roads, in the towns, and in the large cities. Most of these stores are small and supply a limited number of customers. Each store, therefore, needs but a small quantity of each kind of hardware. The retailer may want five dozen grass scythes, five dozen scythe snaths, one dozen scythe stones, 100 gross of screws, three dozen coffee mills, and equally small quantities of twenty other articles. Each of these articles is made by a different class of manufacturers, who make, most of them, only one thing. How impossible it is, then, for the manufacturer of coffee mills to send his agent through the country selling small quantities to different dealers, perhaps finding only one out of three in need of the goods he has for sale. Consider also the expense of shipping such small quantities, and that this expense must all be paid by the consumer in the price of the goods. This situation has been remedied by the development of the jobber, or wholesaler, who is a merchant who buys a large variety of goods of a particular class—such as hardware, shoes, dry-goods—from a number of manufacturers, with the intention of selling these goods to the retail trade.

Observe the contrast between the situation just presented, in which the manufacturer attempts to supply the retail trade, and the system by which products are distributed through the jobber. In place of the manufacturer selling to the retailer a dozen scythe blades, worth perhaps \$5.00, the jobber sells him different quantities of perhaps 100 articles, making perhaps a car load, worth a thousand dollars. It is unnecessary to do more than to point out how much cheaper these goods can be sold through the jobber than by the manufacturer direct. The advantage to the manufacturer also is great, for he sells in large quantities—in car load lots—to the jobber, greatly reducing his selling cost and simplifies his bookkeeping. The distribution of consumption goods, then, is carried on through the wholesaler to the retailer, and it is with relations between wholesaler and retailer that we are next concerned.

(240) Relations Between Wholesaler and Retailer

The wholesaler keeps on hand, in his store rooms, large

stocks of the merchandise in which he deals, and sells this to the retail trade in assorted lots by means of commercial travelers, or "drummers," as they are called, who make periodical trips through the district that the wholesaler aims to cover, a district sometimes including all the states and territories, with Canada and Mexico added. These "drummers" call upon the retail dealers in their line and secure orders which they forward to the central or branch office which arranges for the shipment of the goods. The amount of particular orders secured from retailers doing the same amount of business varies with the character of the product. The greater the fluctuations in price and the more irregular the demand for an article, the smaller will be the single order and the more frequent must be the visits of the salesmen representing it.

(241) Competition

There is great rivalry between wholesale houses, and much of the business that a salesman secures is competitive business. The dominant consideration influencing a retail dealer in placing an order is the price of the goods, but, as between houses offering goods to him at the same prices, that one will be favored whose reputation for excellence of quality of goods, promptness of delivery and courteous dealing with customers is the best; and whose representatives are best able to ingratiate themselves with the retail dealers. The traveling salesman stands for his house. If he is pleasant, truthful, courteous, and manly, and if his principals possess the like good qualities, his house will get orders. If, on the other hand, he is of low moral tone, rude, and untruthful, or if his house fails to support him by living up to his honestly made claims and arrangements, the quoted prices of that house may be lower than those of its competitors, but its interests will suffer in the competition.

(242) Relations Between Wholesaler and Retailer

The wholesaler generally sells his goods to the retail trade on time, usually 60 or 90 days or even six months. In case, however, the retailer is ready to pay cash for his purchases, a discount, usually of five per cent. from the face of the bill, is al-

lowed. Few retailers have as yet grasped the possibilities of profit in the cash discount system. Suppose a retail dealer turns his active stock three times during the year, and that the face value of the bills sent him from the wholesale house every four months amounts to \$10,000. Let us say, that he buys on time, and pays the full value of the bills, making also a profit of five per cent., or \$500, for the sale of the goods to his customers during the same period. Suppose now that the retail dealer, being a man of good standing in his community, decides to borrow money at his bank in order to take advantage of the cash discount of 5% which the wholesale house offers him, and borrows from his local bank, at 6 per cent. interest, sufficient money to pay cash for his goods at \$10,000 every four months. The amount of the interest which he pays to the bank is \$600, and the amount of the discount that he receives from the wholesale house is \$1500, the difference \$900 being the profit that the retailer makes by securing his credit at home, where he is well known, instead of from the wholesale house, which, from necessity, cannot be so well acquainted with him as his local banker. The advantages to retail merchants of this practice of borrowing to take advantage of cash discounts is so great that it is being adopted in many places.

(243) The Credit Department

In most cases, however, the goods are bought by the retailer on time. In other words, the wholesaler must trust the retailer; must send him goods without present payment, looking to a date perhaps six months ahead for reimbursement. In order that he may trust the retailer it is necessary that the wholesaler should be accurately informed as to the character and financial standing of his customers. To obtain this information, a special department is maintained in wholesale establishments called the credit department, which makes a business of keeping track of the financial standing of customers. When a retailer wishes to open an account with a wholesale house, he either sends or, better, presents in person, a statement of his resources, his cash capital, the amount of business he expects to do or is doing, the custom upon which he counts to sustain

his store, his previous experience in business, and such certificates of his reputation for honesty, diligence, intelligence and good moral character as he can obtain from men of responsibility in the community in which he lives. The credit man investigates the evidence presented, often by a personal visit, and then decides whether the applicant is entitled to credit, and if his application is granted, the amount of credit that he is entitled to receive. As an evidence of good faith, with the first order, it is usual to require part payment in cash.

(244) Considerations Influencing the Credit Man

The considerations which influence the credit man in deciding upon an application for a credit account are as follows: The written statements of the applicant are first verified. But this is not sufficient. Other matters may be taken into account. Is the applicant married or single? A married man has the preference because he is more "settled" and because his responsibilities are greater than those of a single man. Does the applicant carry life or fire insurance? What are the amounts of the policies and are they unassigned so as to be available for the payment of his debts? How much does the applicant owe to relatives, employees or others? What are his actual business and private expense? Does he keep a regular set of books and take a regular inventory of stock? What are his family ties, i. e., has he relatives of financial standing? What are the vocations of the other members of his family—have they succeeded or failed? What are his personal habits? If he is a hard drinker, or a loose liver, his financial standing is always doubtful. What is the general character of the community? Have the leading men failed in business? If so, the force of public opinion cannot be counted on to coerce a wavering debtor. Such points and many others are considered by the credit man before he grants an account.

Moreover, through information given him by the traveling salesmen, through his own visits, through the newspapers of different localities, and on the evidence of general business conditions in a locality—such, for example, as a strike in the local mill which throws a thousand men out of work, or the failure

of the staple crop of a district, which will make collections from the farmers slower than usual, through all the different channels of information to which he has access, including the published reports of the commercial agencies, such as Dun and Bradstreet, and by taking account of every circumstance that may reasonably affect the ability of a customer to pay his debts, the credit man varies the amount of credit that his house extends to its different customers or, when necessary, refuses credit altogether. On the other hand, should the conditions warrant, the credit man will not hesitate to grant an extension of credit to a customer in good standing, whom such a concession might greatly favor; or when, no matter what the character of the customer, a delay in urging payment may save from bankruptcy and the house from loss. The credit man is very often a member of the firm, and it is upon his shoulders that the safety of the business ultimately rests.

(245) The Organization of a Retail Store

We now enter the field of retail dealing, and here the endeavor will be to present as briefly as possible the concrete rules upon which a successful retail business is conducted. In establishing a retail business, the first thing to consider is the choice of a line of goods. As a general thing, it is unwise to introduce in a town of stationary population a line of goods already well represented. It may be assumed that the field is supplied. A new line of goods may, however, succeed. A new town without representatives in a given line, or a rapidly growing town is the best location. As a rule, it is unsafe to count upon one's ability to take away their business from established merchants by cutting prices. These merchants have their customers of long standing who are attached to them, and whose habits are fixed. It will take more than price cutting to attract these customers to a new firm. And price cutting is expensive, leading often to bankruptcy. It is no doubt possible to succeed in a town of stationary population by offering new and attractive goods, if the established stores are behind the times, but no enterprising man cares to locate in a dead town. The cities are spreading out into the country; new towns are springing up throughout

the West and South; and there are abundant opportunities to start a grocery or a hardware store where one can be sure of business. It should be remembered that a retail store is a local affair. It thrives from local connections because it is convenient, and because, for one reason and another, people get into the habit of patronizing it. In view of this fact, the beginner should always, if possible, start his plough in new ground. In regard to location and external appearance, the store should be on a main street; its floor should not be more than one step above the sidewalk; it should be large, well lighted and ventilated; its windows, floors and counters, and the sidewalk in front of it should be clean, and its stock should be neatly arranged and kept in order. Having established our store, we proceed to discuss the principles that should regulate its management.

(246) First Essential of Success in Retail Business

The first essential to success in retail business is to buy to the best advantage. To this end, as in the case of the buyer for a factory or wholesale establishment, the retail buyer, who is usually the proprietor or partner, must thoroughly understand the goods he wishes to buy; must know when particular goods are needed, and must be well posted on the market. The characteristics of a good buyer appear also in dealing with salesmen. The business of the salesman is to persuade the buyer. The business of the buyer is to use his own judgment, and to get the goods at the lowest prices possible. To this end, a good buyer assumes a receptive attitude and, volunteering no information himself, learns what he can from the salesman. A good buyer does not higggle over terms by offering a lower price than is asked. He takes the salesman's word for it that the prices quoted are the best he can do and if they are not satisfactory, tells him so. The salesman then, if it is at all possible, can lower the quotation. Wherever possible, the buyer should favor the salesman, who can do him much good or harm with his house, and who is a storehouse of useful information on the line of goods, much of which it will pay the buyer to know. It is better to buy in small quantities because of the smaller risk involved in disposing of the goods. Larger dis-

counts are given on large quantities, but, in spite of this apparent gain, interest, storage and insurance more than balance the discount. When buying in small quantities, moreover, advantage can be taken of changing styles and patterns. A good buyer will always be on the lookout in the trade papers for signs of a rising market, and will buy heavily at the beginning of the rise.

The wholesale buyer, with his wide outlook, almost always accumulates a heavy stock at the beginning of an upward movement of prices, and is thus able to make a large profit from retailers who have neglected to do the same, and who are forced to pay the market prices. If the retail buyer follows the lead of the wholesale buyer, he will perhaps be in a position to mark up the goods to his customers, and thus gain the same advantage that the jobber would gain over him. It is a safe rule never to buy at high prices, and, as a general thing, high prices do not last. The large profits that are made, tempt other manufacturers into the field; the supply of goods is increased, and prices must be lowered in order to dispose of the stock. As between different classes of goods, staples should receive most attention from the buyer, and a new article should only be purchased because a customer has inquired for it, or because the conditions of the community plainly warrant its purchase. For example, the installation of an electric light plant in a town would justify the local hardware man in laying in a supply of electric fans. To some extent, however, the dealer may stimulate demand by slowly introducing new and attractive varieties of staples in the form of fancy groceries, apple peelers, churns, curry-combs, etc. He can have the customers' attention called to these, and can often make a large profit before his competitors realize what he is doing.

(247) Want Cards

As to the amount to buy, the different departments of a large store or the proprietor of a small store, can keep up a system of want cards upon which the needs of a particular stock are noted. The buyer, from these cards, compiles his "want book" so that when the salesman calls, the buyer knows exactly what the wants of the stock are. In many cases, stock is

wanted immediately, when it is the custom to order direct from the house without waiting for the salesman. It is a safe conclusion, however, that higher prices will be charged on an order by letter, unless a number of inquiries with notes of other quotations are sent out, than when the order is given to the salesman, who knows that others are in the field.

(248) Inventory

Once each year, in order that buying should be intelligently carried on, an inventory should be taken. Every article of merchandise in the store should be counted or weighed, or measured, and entered in a book with the cost price and the amount of its value found. The prices should be the actual cost of the goods when bought with expenses of shipment added, with this exception—if goods are lower in price than when bought, the lowest price should be taken. The chief value of an inventory to the merchant is to aid him in finding out his net worth. But it is also of value in showing him what articles sell readily and what do not. Perhaps the slow sales have been due to insufficient advertising and display; but more likely they have been due to miscalculation, on the part of the buyer, of the strength of the demand for that particular article; and a comparison of the invoice book from one year to another is of great value in directing the course of the buyer. It also enables the merchant to put his finger on the weak spots in his business, and to remedy in the future some of the mistakes of judgment which the invoice book shows that he or his clerks have made.

(249) Cash vs. Credit Business

Having purchased the goods, the next thing is to sell them, and here the first question raised is that of a cash versus a credit business. In the United States nearly all retail business has been started on credit. Workmen receive their wages at regular intervals, farmers sell their crops at longer intervals, and it is extremely inconvenient in many cases to pay cash for goods purchased. Credit is demanded by persons in good standing, not as a favor, but as a right. In large cities, and wherever else the supply of money is large and its circulation rapid, a cash business can be done; but throughout the country

and the smaller towns, especially where everybody has an account with everybody else, and where relations of mutual confidence result from general knowledge of each other's affairs, a credit business seems to be the most desirable. An interesting illustration of the difficulty of changing from a credit to a cash business is reported by a hardware merchant from Iowa. The dealers in a small town in an agricultural district made an agreement to sell for cash only, after a certain date and so notified their customers. The new system started off smoothly enough but soon difficulties arose. One merchant sold a good customer some fence wire and loaded it on the customer's wagon before reminding him of the new rule "for cash only." The customer replied that he could unload the wire, whereupon the merchant loaned him the money to pay cash.

(250) Difficulties of the System of Cash Business

Another difficulty arose in cases where responsible people would send by children for articles, stating that they would settle on their next visit to town. The accounts with the county, township, school and road districts, which are always important, had to be credited before they could be paid and this could only be done at regular intervals. The attempted change broke down, and in general such a change is very difficult to accomplish. There is a good reason for this. It is a source of trouble and inconvenience to be always keeping on hand and paying out money for necessities. Even among wealthy people, monthly accounts are the rule because of their convenience. Wherever people are accustomed to deposit their money in bank, the system of check payment is better than any other, for a check furnishes not merely a means of payment, but also a receipt. For these and other reasons, the volume of credit transactions, if only for short periods, is not decreasing. It is, however, unwise to grant indefinite credit, and to allow a customer to pay for goods "when convenient" for him to do so. With many persons, it is never convenient to pay, and the average retailer has to record heavy losses which have resulted from original extensions of credit to unreliable persons, and also from

throwing good money after bad in fear of angering a customer whose account is unpaid. Every one in receipt of income receives his wages, salary, interest, dividends, or rents, at definite dates. The farmer has definite times for selling his crop. Everyone, therefore, should pay his current debts out of his current receipts at the times when money comes into his hands. It is no inconvenience for the retail dealer to insist upon this, and to make it a condition of the extension of credit.

Credit is granted as a convenience to the customer, and when it is granted, a day should be set for payment. If payment is not made, after a reasonable time a second bill should be sent; and if no satisfactory reply is received, no more credit should be given, and a collector should be sent out. Definite, determinate credit such as this, is attended with little risk, for the amount purchased in a week or a month is likely to be moderate. If the further rule is adopted to open accounts with persons of known responsibility only, a credit business can be safely conducted; and since most wholesale houses consider payment inside of thirty days as "cash" payment, prompt payment by the retailer for goods purchased is not interfered with by a system of determinate credits.

(251) Selling of Goods

We now enter upon the most difficult portion of a retail dealer's problem—the selling of goods. In all forms of wholesale business, and in all dealings between manufacturers, the persons concerned are men of intelligence, with definite ideas of the value of goods and definite standards of judgment and measurement. In this field, the contestants are fairly equal, and the only condition of getting business is to sell a good article at a satisfactory price. In the field of retail buying, however, all this is changed; no matter how limited the knowledge of the dealer or clerk concerning the goods that he offers for sale, there is a vast difference between his knowledge and that of the average customer, who usually possesses but little information about his purchases; is largely guided by whim, prejudice and personal relations, and who is extremely open to impressions. It is upon the good will of this individual that the success of a

retail business depends. Whatever measures will attract him should be adopted; whatever will repel him should be avoided. Keeping these facts in mind, it is not difficult to lay down general rules that should guide the retail trader in the conduct of his business.

(252) The Retail Store

The retail store should be an attractive place, to which women and children are glad to come. The windows should be clean, and filled with the most attractive looking goods. Window advertising is now recognized to be more effective than any other kind of display. The department stores pay large salaries to their window decorators, and their window display is changed, often every week. People like to see things, and seeing generally begets the desire of possession. When you notice people stopping before a store window to stare at its contents, you may be sure that the clerks inside will not be idle. Inside the store, the floors, counters, and show cases should be spotless, the stock kept in perfect order and well dusted. In a country store, the rear of the room is generally a lounging place, and the use of tobacco makes cleanliness difficult, but even here profanity, loud talking, or any disorder tending to drive away trade can be prevented. In the town or city store, loafing should not be tolerated. The proprietor and his clerks should correspond to the appearance of the store. They should be neatly dressed and spotlessly clean as to hands, nails, teeth, and face. It should be remembered that each, in the course of a day, stands face to face with perhaps fifty customers, and that personal appearance eventually makes an impression. People like to drink from a clean cup no matter whether they are clean or not. A small matter, but one which most people do not think about, is the unwillingness of ladies to be waited upon by a man in his shirt sleeves, with his hat on, and with a cigar in his mouth or laid on the counter beside him. Go into a large city store on the warmest day. You will see no clerks in shirt sleeves. Not only should the proprietor and his clerks be clean and neat, but it is even more important that they should be courteous and should be—not merely appear—interested in their customers. The customer should be met at the door as

though you were glad to see him, and in fact most retail dealers are. He should be waited upon with care, no matter whether he buys or not. He should, if possible, be accompanied to the door when leaving, and during the entire time of his stay, should be made to feel welcome.

A dealer's friends are his best customers. It requires strong influence to wrest them from him, and the more friendly he is, the more friends he will have. The selling policy should be in accord with the general policy of the store. Absolute candor should be the rule. A reputation for truthfulness and fair dealing is worth much, is sufficient in fact, to counterbalance many disadvantages under which the store may labor. The clerk or proprietor should be thoroughly informed in regard to the stock so as to be able to advise the customer; and if, in his judgment, the wants of the customer would be best served by a cheaper article, he should unhesitatingly recommend its purchase. Advice of this character, which is plainly disinterested, is long remembered to the store's credit. In the same connection, care should be taken not to disparage a rival. Invidious criticism of a competitor, besides making bad feeling between men who need not be enemies, is apt to awaken in the mind of the customer a suspicion that the goods and the man that are being so severely censured may be worthy of attention. Goods should always be delivered when delivery is requested. Cleanliness, courtesy, candor are three watchwords of retail success.

(253) Other Questions of Interest to the Retail Dealer

The retail dealer should not talk politics, especially in a political campaign. He should belong to as many local societies and organizations as he conveniently can attend to, including some local church. He should do this not merely to gratify his social or religious instincts but in order to extend his circle of acquaintances. He should endeavor to identify his clerks with his own interests by paying them good wages and by eventually giving them an interest in the business if they prove to be sufficiently valuable. The loss of a clerk to a competitor is a loss of custom, especially if the clerk has many friends; for his friends go with him. The retailer should advertise in the

local newspapers, and in his advertisements try to explain fully just why the goods he offers are desirable—not merely assert that they are, but show why they are. It is ordinarily not difficult for a dealer to obtain an exclusive agency for a town, and then he has merely to tell the truth frequently and conspicuously about the merits of these goods to attract and hold custom. It is, moreover, on exclusive goods that large profits are made.

Attractive circulars, mailed to customers—not shoved under their doors—are of great assistance in bringing new goods to their attention. Advertising is of peculiar importance in introducing these new goods. As for well known staples, the general reputation and conduct of the store will suffice, but people must be educated to appreciate something new. As to prices, it is difficult, as already shown, to hold trade by cutting prices, unless the low prices continue; and the margin of profit in most retail stores is not large enough for that. A profit of twenty per cent. on a moderate capital of \$5000, for instance, will not be found excessive. Interest on this amount should be counted at 6 per cent., and the \$700 remaining is little more than sufficient to pay for the services of the proprietor, and something besides to cover the risk involved. Price cutting is desirable only when the invoice shows an accumulation of "dead stock," i. e., goods unsalable at regular prices. It is bad policy to allow this dead stock to accumulate, and it should be sold for what it will bring. Judicious advertising of the sale will usually carry off the goods at something above cost. It often happens that the dealers in a town can arrange some basis of agreement on the prices of staple articles; on shipping together, so as to obtain carload rates, always lower than the rates on small consignments; on buying together in order to obtain a larger discount on large purchases, and to protect themselves against new comers who may try to get business by cutting prices. A most effective way of dealing with trouble of this character is for each of the established dealers to meet the stranger's cut on some one class of goods, while charging reasonable prices for the remainder. The usual result is a speedy withdrawal of the intruder from the field. Any such movement toward co-opera-

tion among retail dealers is gratifying evidence of friendliness, as well as a source of profit to those who engage in it.

RECENT CHANGES IN THE ORGANIZATION OF TRADE

(254) The Tendency to do Away With Both Wholesaler and Small Retailer

The final subject that will be discussed is one of increasing interest to all those who are expecting some day to be merchants. I refer to the growing tendency to do away with both wholesaler and small retailer, and to institute more direct dealings between manufacturer and consumer. This tendency seems to be in line with progress. Any reduction in the number of middlemen, it would seem, would be a gain to the public. This tendency toward the simplification of distributive trade appears in two movements: (1) The elimination of the wholesale and retail dealer by the department store and the catalogue house, and (2) the elimination of all middlemen by direct dealing between manufacturer and consumer.

(255) The Advantages of the Department Store in Cities and Large Towns

It is, on its face, a retail establishment, but it contains many features that the retail store does not have. It is the direct descendant of the general store at the cross-roads that kept everything the community used—dry goods, groceries, hardware, boots and shoes and other lines. In the same way, the huge department store in the large city is, as its name implies, made up of many departments under the same roof, where can be found practically everything the customer needs—all the staples and novelties of ordinary retail trade, including farm machinery and harness, and also dental, medical, legal and photographic departments, besides many others. The department store aims to supply to the customer, from one establishment, all the services and all the commodities which he needs. It depends for its success on dense population and rapid transit. It has a large capital and often does an immense business. The de-

partment store enjoys certain great advantages over the ordinary retailer. It can buy directly from the manufacturer, and thus can obtain better prices than the retailer. It can discount its own bills. It can buy up bankrupt stocks at sacrifice prices. It can, by displaying many lines of goods close at hand, call the purchaser's attention to some article that he had not thought he wanted, coming to the store for something else; and, in this way, such a store makes one department aid another. On this account, the stock of a department store can be turned more rapidly than that of the ordinary retailer. The same reason explains the gain to the department store from its "bargain days" which come every day at some counter. The customer is attracted by the cheapness of the bargain counter, and before leaving the store probably buys several other things which are not bargains. The dead stock of the department is readily worked off over the bargain counter.

Another advantage of the department store lies in its superiority in advertising. It can combine the small notices of fifty retailers into a huge broadside in a daily paper and can pay large salaries to its advertising experts. The large advertisements of Wanamaker's store in Philadelphia, for example, appear simultaneously in several Philadelphia papers, and are read each morning by tens of thousands of people who want the things described. The department store can also attract custom by music; display of pictures; attractive waiting rooms; and, above all, by the fact that it is a "big" place to which people like to go. It is also claimed, although the writer believes in most cases, unjustly, that the great department stores of the large cities have deliberately crushed the small retail dealer by running different departments at an actual loss, living upon the profits of the other lines, until the small dealer has been driven out of business. While this may have been done in some cases, the real explanation of the failure of retail dealers who had to meet this competition is made up of the advantages of the department stores enumerated above. It is, however, true that the result of the growth of the department store system has been to drive out of business a large number of retail dealers in all of our large cities.

(256) The Operations of the Mail-Order House

Here the attempt is made to reach the consumers scattered over the country and to sell them goods by sample or descriptive circular. The business of the mail-order house is carried on mainly in the West. Twice each year these houses send out large catalogues filled with descriptions of thousands of articles and giving the prices at the house, the customer paying the freight. In addition to these catalogues, the order house will, when requested, send samples of goods that permit it, such as dry goods, etc. The mail-order houses do an enormous business. One house in Chicago reports two million customers. In some things the mail-order house enjoys the same advantages as the department store. It can buy directly from the manufacturer, and can discount its own bills. It can pick up bankrupt stock, and its sales are strictly for cash. Sometimes mail-order houses have their own factories. No traveling salesmen are required, but extensive advertising in local newspapers is done. The mail-order house sells in larger variety and at lower prices than the retail dealer in the small town, and so forces the local retailer to lower his prices.

(257) The Effect of Department Stores and the Mail-Order House Departments Upon the Retail Stores

What can the retail dealer do to offset this development of central distributive agencies? His case would seem to be hopeless. The department store attacks him in the cities and large towns and the mail-order house reaches out into the smaller towns and into the country seeking whom it may devour.

There is, however, something to be said on the other side, and some reason to believe that the retail store can defend itself against the attacks of the department store and the catalogue house. In spite of their great power, these institutions labor under serious disadvantages. The personal element is wanting in both, especially in the business of the mail-order house. There is little opportunity for the establishment of friendly relations. In the department store, the idea is to sell, no matter what the consequences of loss of custom. The loss of a few customers is of little importance among so many. Department

store clerks are, as a rule, less competent than the clerks of the better grade of retail houses. They are ill paid, for one thing, and there is less opportunity to train them. Moreover, they work under the eye of subordinates who have not the same interest as the owner of a retail store in their work. For this reason, and also because of the general policy of buying any stock that can be had at low figures, the quality of the goods sold by the average department store, and the adaptation of those goods to the wants of the customer, are below the average of well managed retail business. In even the best of the department stores, there is general complaint of the carelessness and ignorance of clerks, and of the inferior quality of the goods. Multitudes of people visit these stores, but not, as a rule, the intelligent buyers who know that the better quality furnished by the good retail store, and the reliability of the retail dealer's claims, will more than offset the higher prices that he may charge. It is even worse with the mail-order house than with the department store. Here there is absolutely no personal contact between buyer and seller, nor any means of seeing goods before they are ordered. The customer must take his chance of disappointment, and he can have small hope of redress if the goods sent him do not come up to the representations of the catalogue. The retail dealer, on the other hand, as has been already shown, can establish personal relations with his customers; he can make them his friends, not merely by courteous treatment, but by careful attention to their wants. He can secure the best goods, assure himself of their quality, and guarantee them to his customers. A department store cannot do this. The retail dealer can constantly emphasize the quality of his goods, and, after his customers have learned that his word is good, they may be depended on to prefer assured quality to doubtful quality, even at lower prices. Moreover, the retail dealer who devotes himself to one line of goods can become far better informed than the department store clerk concerning the goods that he sells; and his superior service is, therefore, not merely the result of interest, but of knowledge as well. It is claimed, and with some reason, that the retail dealers even in the larger cities are holding their own in competition with the department store and catalogue house. If so, it is a

sign that the customer is gradually learning to prefer quality to price. The competition with the department store cannot but prove beneficial in the long run to the retailer. It has enforced upon him the necessity of improving his methods, diversifying his stock, increasing his courtesy and reliability, and perfecting himself in the knowledge of his goods. The public will soon learn, it is to be hoped, that "Jack-of-all-trades is master of none," and that it is better to "buy hats of a hatter, shoes of a shoeman, and glasses of an optician."

(258) Natural Advantages of the Country Retailer over the Catalogue House

The natural advantages of the country retailer over the catalogue house, are even more important than those of the city retailer in competition with the department store. In the country town the buyer can always see the goods, which are much more stimulating to the buying desire than a picture in a catalogue. Goods are also often wanted quickly when there is no time to send to the city. The country retailer can extend credit with safety, which gives him a hold on his customers. He can also, just as the city retailer, help his customers with advice, cultivate personal relations with them, and guarantee the quality of his goods. In the long run, it is not believed that he will suffer in competition with the catalogue house, which can only drive him to diversify his stock, sweep out his store, put on his coat, change his linen oftener and keep his eyes open.

(259) Direct Dealings Between Manufacturer and Dealer

In recent years direct dealing between manufacturer and consumer has been growing, and by some retailers it is feared that all middlemen will eventually be eliminated. The most conspicuous example of direct dealing of this character is furnished by the Big Four Meat Combine, which centers its operations at Chicago. By establishing agencies throughout the South and West, many also having been established in the Eastern states, the meat packers of Chicago have reduced thousands of local butchers to agents' positions or have driven them out of business. The reason is that the independent butcher is at a great disadvantage both in buying and selling. The pack-

ers can pay a higher price than the independent butcher can pay, because they make more out of the by-products than he can make out of the beef, and therefore they get all the best cattle. The local butcher must content himself with inferior stock. Then again, for the same reason that he can pay better prices for cattle, the packer can undersell the local butcher in the local butcher's own market. The packer makes his profit out of the by-product factories. He can sell his meat at cost or below cost and still make money. Owing to this peculiar situation, the retail butcher is fast disappearing.

The Standard Oil Company has also established numerous agencies of distribution and the retail dealer finds little profit in handling coal oil. A celebrated brand of shoe, the Douglas Shoe, is handled through stores owned by the manufacturer. Some attempts have been made to sell cigars and tobacco in the same manner. Sometimes particular articles are so well advertised that the customer demands them from the retailer. Royal Baking Powder is an example. In such a case the manufacturer can sell his goods at a fixed price and can put the price on the package, taking away all of the middleman's profit. These instances of direct dealing between manufacturer and customer do not, however, indicate the existence of any general tendency toward the destruction of the retail dealer. In the first instance, that of the selling of fresh meat, the retailer is not destroyed; he merely becomes the agent of the packer and this is possible only because the goods that the packer offers for sale are so uniform in quality and so few in number, that they almost distribute themselves, and because, also, they are in such great demand that a fair salary can be paid for distributing them. Meat is the only product of which these things can be said. In the case of the Douglas Shoe, mentioned above, only one kind of shoe is sold and that in the cities and large towns. No attempt is made to obtain variety.

(260) The Wholesaler and Retailer Required

But few articles, finally, can be so well advertised as to sell themselves. So far as can be determined, the retail dealer and the wholesale dealer as well, will continue to be an essen-

tial factor in our economic organization. Only through these channels can the wants of the people, constantly growing more complex, and their increasing desire for guaranteed quality in the goods they purchase, be supplied. It is to be expected that the attempts that have been made to oust the retailer from his position will only result in causing him to improve his methods and everywhere become what it is necessary that he should become, a real benefit to the community in which he works.



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